

Annotated Checklist of the Fishes Collected from the Rivers in the Ryukyu Archipelago

Harumi Sakai¹, Mitsuaki Sato² and Morizumi Nakamura^{3,†}

¹National Fisheries University, 2–7–1 Nagata-honmachi, Shimonoseki, Yamaguchi 759–6595, Japan (sakaih@fish-u.ac.jp)

²Japan N. U. S., 3–9–5 Kaigan, Minato-ku, Tokyo 108–0022, Japan

³Former head of the Second Laboratory of Zoology, National Science Museum, Tokyo, Japan

Abstract Three hundred and eight species and 8 subspecies of fishes (310 species/subspecies), representing 160 genera in 70 families, were recorded from the rivers of the Ryukyu Archipelago. Most of these comprised indigenous fishes, although 18 species and 2 subspecies of introduced fishes were also recorded. Of the former, only 5 species were primary freshwater fishes, the others being diadromous. About 40 species/subspecies were collected primarily from freshwater. However, species' diversity was great in brackish water zone. The indigenous species/subspecies (except for 12 undescribed fishes, the distribution ranges of which remain undetermined) were classified into three zoogeographic categories: those from south of the Ryukyu Archipelago (southern species, 240 species/subspecies), those from the Ryukyu Archipelago to Japan proper (northern species, 29 species/subspecies) and those endemic to the Ryukyu Archipelago (11 species/subspecies). The number of species decreased gradually from the southern to northern islands.

Key words: Freshwater fish; brackishwater fish; diadromous fish; salinity; Kuroshio current; distribution; island zoogeography

Introduction

The Ryukyu Archipelago (Ryukyu Rettou) is located at the border of the Pacific Ocean and East China Sea, being a chain of islands between Kyushu and Taiwan, comprising the Ohsumi Group (Tanegashima and Yaku-shima islands), Amami Group (Amami-ohshima and Tokunoshima islands), Okinawa Group (Okinawa Island and adjacent small islands), Miyako Group (Miyako Island and adjacent small islands), Yaeyama Group (Ishigaki, Iriomote and Yonaguni islands) and more than one hundred other smaller islands (Fig. 1). They are sectioned into three parts by two marine geographical gaps deeper than 1,000 m (Kimura, 1996); the Tokara (between Ohsumi and Amami–Okinawa groups) and Kerama gaps (between Amami–Okinawa and Miyako–Yaeyama groups). However, Kimura (1996) argued that land bridges

[†] Passed away January 19, 1998.

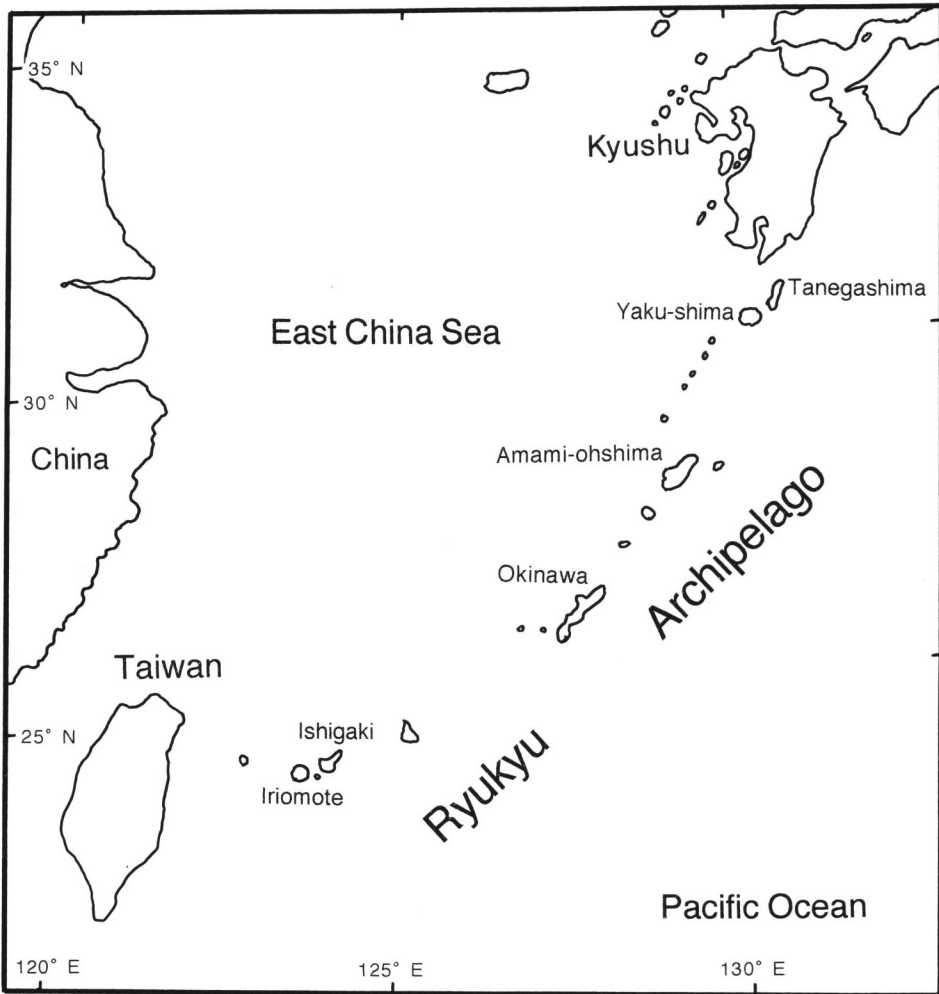


Fig. 1. Map of the Ryukyu Archipelago.

might have appeared and connected the Ryukyu Archipelago to Taiwan and/or Kyushu in two stages since the late Pliocene; in the late Pliocene to the early Pleistocene and in the late Pleistocene.

Because the Ryukyu Archipelago are well known for their many rare endemic vertebrates, including *Mayailurus iriomotensis* (mammal), *Rallus okinawae* (bird), *Rana ishikawae* (frog) and *Plecoglossus altivelis ryukyuensis* (fish) (Japan Environmental Agency, 1991), the zoogeography of this region has drawn much attention.

The freshwater fish fauna also imparts important information about island zoogeography. Although many authors (e.g., Kuroiwa, 1927; Jordan and Tanaka, 1927;

Tomiyama, 1936; Okada and Ikeda, 1938, 1939) have studied freshwater fishes of the Ryukyu Archipelago, such studies were based only on sporadically-made collections. Aoyagi (1948, 1957) pioneeringly referred to the distribution pattern of the region, supposing that the fauna consisted of Indo–Chinese tropical island fishes as argued by Herre (1941), roughly divided into two faunal regions, including the Amami–Ohsumi groups and Yaeyama–Miyako–Okinawa groups, respectively. However, his discussion was hampered by some taxonomic problems and poorly understood species' distribution ranges.

In more recent years, this situation has been steadily resolved, many new and newly-recorded species having been reported (e.g., Hayashi & Ito, 1978a, 1978b; Senou & Suzuki, 1980a, 1980b, 1981a, 1981b; Hayashi *et al.*, 1981a, 1981b, 1992; Suzuki & Senou, 1981, 1982, 1983, 1984; Suzuki *et al.*, 1982; Sakai & Sato, 1982; Shokita *et al.*, 1989; Kochi, 1991). At the present time, about 300 species of fishes have been recorded from the rivers of the Ryukyu Archipelago (e.g., Masuda *et al.*, 1984; Kawanabe & Mizuno, 1989; Nakabo, 1993, 2000). Nevertheless, most literature reports deal with limited parts of the Ryukyu Archipelago or comprise checklists that include fishes from other parts of Japan. Only Kochi (1991) has discussed the zoogeography of freshwater fishes of the Ryukyu Archipelago, in a brief report based on knowledge current at that time, but he did not provide specific distribution data.

We collected fishes on a number of occasions from rivers on six main islands of the Ryukyu Archipelago, recording also the water salinity at each collection site. The results have enabled a more thorough discussion than previously attempted of the freshwater fish zoogeography and the river fish community composition throughout the Ryukyu Archipelago.

Materials and Methods

Fishes were collected at 116 sites in 75 rivers on six islands (Tanegashima, Yaku-shima, Amami-ohshima, Okinawa, Ishigaki and Iriomote islands) (Table 1),

Table 1. Islands surveyed, number of sampling locations, year and season, and mean salinity (ppm) of the freshwater zone.

Island	Number of locations	Year and season	Mean freshwater salinity (number of locations)
Tanegashima	13 (10 rivers)	1974 Autumn, 1975 Summer	46.6 (4)
Yaku-shima	12 (7 rivers)	1974 Spring, Autumn, 1975 Summer	15.9 (6)
Amami-ohshima	18 (13 rivers)	1975 Spring, Summe	42.8 (11)
Okinawa	26 (14 rivers)	1974 Summer, 1975 Summer	49.1 (8)
Ishigaki	22 (15 rivers)	1973 Spring, Autumn, 1974 Summer	62.5 (10)
Iriomote	25 (16 rivers)	1974 Spring, Summer	58.2 (6)

using various collecting equipment, such as dip net, casting net, seine net, fishing rod and snorkeling gear.

At most of the sampling locations, 200 ml of water was collected from the middle layer (if depth less than 100 cm) or at a depth of 50 cm (depth greater than 100 cm) using 200 ml plastic bottles. Water salinity was measured by personnel at the Tokyo Public Health Research Institute. Although the data did not indicate precise habitat salinity for each species, especially those in estuarine zones, rough estimations of the salinity range were possible by accumulating many data points for each species. Mean salinities of the freshwater zone (upper than tidal zone) were 15.9–58.2 ppm according to islands (Table 1). Therefore, the sites recorded higher values than these salinities are from tidal zone of rivers in each island.

The 7473 specimens collected were identified mainly from Nakabo (2000). They are deposited at the Dept. of Zoology, National Science Museum, Tokyo (NSMT).

Species not collected by us, but reported in the literature (151 species, 1 sub-species) are also included in the following list, indicated by an asterisk alongside the species' name.

In the species' accounts are included "Japanese name", "distribution in Japan", "salinity" range of collection locations, catalog numbers, and a taxonomic and/or ecological "note". The "distribution in Japan" is based on the collection records made during the present investigation, supplemented by records in Nakabo (2000) and other recent literature. Distribution range for "southern species" in the present study is expressed adding words "north to" in the description. In Nakabo's (2000) geographic accounts, "southern Japan" and "Nansei Islands" are tentatively interpreted as "southern part of Japan proper" and "from Yaeyama to Ohsumi groups", respectively.

Elopidae

Elops hawaiiensis Regan "Kara-iwashi"

Distribution in Japan: Tanegashima Island (present study), north to Ibaraki Prefecture (Nakabo, 2000).

Salinity: 6,920 ppm.

Specimens examined: NSMT-P 29336.

Megalopidae

Megalops cyprinoides (Broussonet) "Isegoi"

Distribution in Japan: Iriomote and Amami-ohshima islands (present study), north to Niigata Prefecture and Tokyo Bay (Nakabo, 2000).

Salinity: 37.2–396 ppm.

Specimens examined: NSMT-P 28299, 28403, 28982, 29035, 29274.

Anguillidae*Anguilla japonica* Temminck et Schlegel “Unagi”

Distribution in Japan: Ishigaki, Iriomote, Okinawa, Amami-ohshima, Tanegashima and Yaku-shima islands (present study), north to Hokkaido (Nakabo, 2000).

Salinity: 13.2–24,400 ppm.

Specimens examined: NSMT-P 15817, 28246, 28413, 28579, 28660, 28715, 28724, 28743, 28847, 28860, 28892, 28928, 28970, 28983, 29084, 29087, 29092, 29096, 29124, 29140, 29150, 29178, 29182, 29189, 29201, 29242, 29250.

Anguilla marmorata Quoy et Gaimard “Oo-unagi”

Distribution in Japan: Ishigaki, Iriomote, Okinawa, Amami-ohshima, Tanegashima and Yaku-shima islands (present study), north to southern Japan (Nakabo, 2000).

Salinity: 23.8–34,300 ppm.

Specimens examined: NSMT-P 15816, 28111, 28206, 28213, 28226, 28260, 28363, 28385, 28599, 28606, 28630, 28673, 28696, 28716, 28861, 28901, 28971, 28984, 28990, 28995, 29030, 29051, 29110, 29251.

Muraenidae**Echidna rhodochilus* Bleeker “Namida-kawa-utsubo”

Distribution in Japan: North to Iriomote Island (Nakabo, 2000).

Uropterygius concolor Rüpell “Koge-utsubo”

Distribution in Japan: North to Amami-ohshima Island (present study; Sakai & Sato, 1982).

Salinity: 38,700 ppm.

Specimens examined: NSMT-P 20771.

Ophichthidae**Muraenichthys macropterus* Bleeker “Kuri-mimizu-anago”

Distribution in Japan: Yaeyama Group (Senou & Suzuki, 1980a), north to Ryukyu Archipelago (Nakabo, 2000).

Pisodonophis boro (Hamilton) “Gomahotate-umihebi”

Distribution in Japan: Okinawa Island (present study), north to Kochi Prefecture (Nakabo, 2000).

Salinity: 22,800 ppm.

Specimens examined: NSMT-P 20928.

Clupeidae

Herklotsichthys quadrimaculatus (Rüpell) “Mizun”

Distribution in Japan: Iriomote Island (present study), north to Okinawa Island (Nakabo, 2000).

Salinity: 34,000 ppm.

Specimens examined: NSMT-P 28501.

Nematalosa come (Richardson) “Ryukyu-dorokui”

Distribution in Japan: Yaeyama Group (present study), north to Okinawa Island (Nakabo, 2000).

Salinity: 16,000–34,300 ppm.

Specimens examined: NSMT-P 15878, 15984, 28112, 28317, 28502.

Nematalosa japonica Regan “Dorokui”

Distribution in Japan: Amami-ohshima Island (present study), north to southern Japan (Nakabo, 2000).

Salinity: 12,800 ppm.

Specimens examined: NSMT-P 28943.

Sardinella melanura (Cuvier) “Oguro-iwashi”

Distribution in Japan: North to Ishigaki Island (present study), Ogasawara Islands (Nakabo, 2000).

Salinity: 9,520 ppm.

Specimens examined: NSMT-P 28176.

Note: Although this record is the first from the Ryukyu Archipelago supported by an accompanying specimen, a photograph of this species taken off Iriomote Island, was published by Okamura & Amaoka (1997).

Engraulididae

**Setipinna tenuifilis* (Valenciennes) “Tsumari-etsu”

Distribution in Japan: North to Ryukyu Archipelago (Nakabo, 2000).

Stolephorus indicus (van Hasselt) “Indo-ainoko-iwashi”

Distribution in Japan: North to Okinawa Island (present study; Nakabo, 2000).

Salinity: 8,960 ppm.

Specimens examined: NSMT-P 28943.

**Stolephorus commersonii* Lacepède “Yaeyama-ainoko-iwashi”

Distribution in Japan: North to Ishigaki Island (Kimura *et al.*, 1999).

**Thryssa baelama* (Forsskål) “Oh-iwashi”

Distribution in Japan: Yaeyama Group (Senou & Suzuki, 1980b), Ogasawara Islands, north to Ryukyu Archipelago (Nakabo, 2000).

Chanidae

Chanos chanos (Forsskål) “Sabahii”

Distribution in Japan: Ishigaki, Iriomote and Tanegashima islands (present study), north to Kochi Prefecture (Nakabo, 2000).

Salinity: 121–32,700 ppm.

Specimens examined: NSMT-P 15755, 15794, 15860, 15962, 15985, 28406, 28407, 28435, 28453, 28472, 29342.

Cyprinidae

Carassius auratus langsdorfii Cuvier et Valenciennes “Gin-buna”

Distribution in Japan: Ishigaki, Iriomote, Okinawa, Amami-ohshima and Tanegashima islands (present study), Japan proper (Nakamura, 1969).

Salinity: 34.3–3,070 ppm.

Specimens examined: NSMT-P 15939, 28214, 28218, 28674, 28680, 28787, 28849, 28858, 28863, 28973, 28985, 29036, 29041, 29048, 29179, 29183, 29387, 29388, 29389, 29390, 29391, 29392, 29441, 29442, 29443, 29444.

Note: According to Kobayashi (1985), specimens from Yaeyama Group possessed a diploid chromosome number, whereas those from Okinawa, Amami-ohshima and Tanegashima islands included both diploid and triploid individuals.

**Carassius auratus* subsp. 1 “Naga-buna”

Distribution in Japan: Okinawa Island (Kochi, 1991), Suwa Lake (Nakamura, 1969).

Note: Introduced in 1970 (Kochi, 1991).

**Carassius cuvieri* Temminck et Schlegel “Gengorou-buna”

Distribution in Japan: Okinawa Island (Kochi, 1991), Biwa Lake (Nakamura, 1969).

Note: Introduced from Taiwan in 1972–1973 (Kochi, 1991).

Cyprinus carpio Linnaeus “Koi”

Distribution in Japan: Amami-ohshima Island (present study), Okinawa Island (Kochi, 1991) and Japan proper (Nakamura, 1969).

Salinity: 3,070 ppm.

Specimens examined: NSMT-P 28848.

Note: Probably introduced (Kochi, 1991).

**Pseudorasbora parva* (Temminck et Schlegel) “Motsugo”

Distribution in Japan: Okinawa Island (Kochi, 1991), Kyushu to Kanto District (Nakamura, 1969).

Note: Introduced in 1975 (Kochi, 1991).

Cobitidae

Misgurnus anguillicaudatus (Cantor) “Dojou”

Distribution in Japan: Okinawa, Amami-ohshima and Tanegashima islands (pre-

sent study), Ishigaki Island (Kochi, 1991), Japan proper (Nakamura, 1969).

Salinity: 48.2–2,000 ppm.

Specimens examined: NSMT-P 28675, 28687, 28717, 28933, 29141, 29151, 29180, 29202, 29299.

Clariidae

Clarias fuscus (Lacepède) “Hire-namazu”

Distribution in Japan: Ishigaki Island (present study).

Salinity: 60.9 ppm.

Specimens examined: NSMT-P 15986.

Note: Introduced from Taiwan in the 1960s (Arai & Hirano, 1974; Kochi, 1991).

Plotosidae

**Plotosus lineatus* (Thunberg) “Gonzui”

Distribution in Japan: Yaeyama Group (Senou & Suzuki, 1980a), north to Toyama bay (Okamura & Amaoka, 1997).

Loricaridae

**Liposarcus disjunctus* (Hancock) “Madara-loricaria”

Distribution in Japan: Okinawa Island (Nakabo, 2000).

Note: Introduced from Brazil (Nakabo, 2000).

Plecoglossidae

Plecoglossus altivelis altivelis Temminck et Schlegel “Ayu”

Distribution in Japan: Yaku-shima Island (present study), western Hokkaido to Kyushu (Nakabo, 2000).

Salinity: No data.

Specimens examined: NSMT-P 29102, 29111, 29337.

Plecoglossus altivelis ryukyuensis Nishida “Ryukyu-ayu”

Distribution in Japan: Okinawa and Amami-ohshima islands (present study).

Salinity: 34.3–53.3 ppm.

Specimens examined: NSMT-P 28654, 28679, 28867, 28874, 28909, 28972, 29275.

Note: Originally endemic to Okinawa and Amami-ohshima islands. The Okinawa Island population subsequently having become extinct (Japan Environmental Agency, 1991), individuals from the Amami population have been introduced to Okinawa Island (Shinomiya, 1998). This subspecies is listed as endangered (EN) in the Red Data report by Okinawa Prefecture (1996) and in the Data Book by the Japan Fisheries Agency (1998), and as critically endan-

gered (CR) in the Red List by the Japan Environmental Agency (1999).

Synodontidae

**Saurida gracilis* (Quoy et Gaimard) “Madara-eso”

Distribution in Japan: Yaeyama Group (Senou & Suzuki, 1980a), north to Ryukyu Archipelago (Nakabo, 2000).

Atherinidae

Atherinomorus lacunosus (Schneider) “Yaku-shima-iwashi”

Distribution in Japan: Yaeyama Group (present study), north to southern Japan (Nakabo, 2000).

Salinity: 2,110–16,000 ppm.

Specimens examined: NSMT-P 15830, 15874, 15879, 15951, 28178, 28809.

**Hypoatherina woodwardi* (Jordan et Starks) “Okinawa-tougorou”

Distribution in Japan: Ryukyu Archipelago (Nakabo, 2000).

Poeciliidae

Gambusia affinis affinis (Baird et Girard) “Kadayashi”

Distribution in Japan: Ishigaki, Iriomote and Okinawa islands (present study).

Salinity: 43.5–34,300 ppm.

Specimens examined: NSMT-P 15733, 15779, 15795, 15936, 15940, 20913, 28113, 28216, 28291, 28364, 28386, 28436, 28473, 28705, 28718, 28725, 29322.

Note: Introduced from Taiwan in 1919 for biological control of mosquito larvae (Kochi, 1991).

**Poecilia reticulata* Peters “Guppi”

Distribution in Japan: Yaeyama Group and Okinawa Island (Kochi, 1991).

Note: Introduced in the 1960s (Kochi, 1991).

**Xiphophorus helleri* Heckel “Sohdoteiru”

Distribution in Japan: Kume Island (Okinawa Group) (Kochi, 1991).

Note: Introduced in the 1960s (Kochi, 1991).

**Xiphophorus variatus* (Meek) “Variatasu”

Distribution in Japan: Okinawa Island (Kochi, 1991).

Note: Introduced in the 1960s (Kochi, 1991).

Adrianichthyidae

Oryzias latipes latipes (Temminck et Schlegel) “Medaka”

Distribution in Japan: Yaku-shima, Amami-ohshima and Okinawa islands (present study), widely distributed in Japan except for Hokkaido (Uwa, 1990).

Salinity: 37.2–6,920 ppm.

Specimens examined: NSMT-P 28676, 28688, 28777, 28986, 29049, 29203, 29300.

Note: The Ryukyu population is genetically different from other populations, being grouped as the Ryukyu type (Sakaizumi, 1990). The former is listed as vulnerable (VU) in the Red Data report by Okinawa Prefecture (1996) and as endangered (EN) in the Data Book by the Japan Fisheries Agency (1998). The subspecies as a whole is listed as vulnerable (VU) in the Red List by the Japan Environmental Agency (1999).

Hemiramphidae

Zenarchopterus dunkeri Mohr “Komochi-sayori”

Distribution in Japan: Yaeyama Group (present study), north to Miyako Island (Nakabo, 2000).

Salinity: 9,520–30,000 ppm.

Specimens examined: NSMT-P 28177, 28503, 29285.

Hyporhamphus quoyi (Valenciennes) “Sennin-sayori”

Distribution in Japan: Iriomote Island (present study), Ogasawara Islands, north to Nagasaki Prefecture (Nakabo, 2000).

Salinity: 14,000 ppm.

Specimens examined: NSMT-P 29276.

Note: Sakai & Sato (1982) misidentified this specimen as *Hyporhamphus balinensis*.

Belonidae

**Strongylura incisa* (Valenciennes) “Ryukyu-datsu”

Distribution in Japan: Iriomote Island (Senou & Suzuki, 1981a), north to Ryukyu Archipelago (Nakabo, 2000).

Fistulariidae

**Fistularia commersonii* Rüpell “Ao-yagara”

Distribution in Japan: Amami-ohshima Island (Hayashi *et al.*, 1992), north to southern Japan (Nakabo, 2000).

Syngnathidae

**Corythoichthys haematopterus* (Bleeker) “Ishi-yoji”

Distribution in Japan: Yaeyama Group (Senou & Suzuki, 1980a), north to Izu Peninsula (Nakabo, 2000).

Hippichthys (Hippichthys) cyanospilus (Bleeker) “Hakuten-yoji”

- Distribution in Japan: North to Okinawa Island (present study; Nakabo, 2000).
Salinity: 1,900 ppm.
Specimens examined: NSMT-P 28582.
- Hippichthys (Hippichthys) heptagonus* Bleeker “Amime-kawa-yoji”
Distribution in Japan: Ishigaki Island (present study), north to Yaeyama Group (Nakabo, 2000).
Salinity: No data.
Specimens examined: NSMT-P 15901.
- Hippichthys (Hippichthys) spicifer* (Rüpell) “Kawa-yoji”
Distribution in Japan: Ishigaki, Iriomote, Okinawa, Amami-ohshima and Tanegashima islands (present study), north to Sagami Bay (Nakabo, 2000).
Salinity: 770–34,300 ppm.
Specimens examined: NSMT-P 15784, 15831, 15988, 28114, 28140, 28179, 28342, 28474, 28581, 28745, 28801, 28944, 29015, 29204.
- **Hippichthys (Parasyngnathus) penicillus* (Cantor) “Ganten-ishi-yoji”
Distribution in Japan: Tanegashima Island to Kii Peninsula (Nakabo, 2000).
- Hippocampus kuda* Bleeker “Kuro-umi-uma”
Distribution in Japan: North to Okinawa Island (present study; Nakabo, 2000).
Salinity: 18,800 ppm.
Specimens examined: NSMT-P 29301.
- **Micrognathus andersonii* (Bleeker) “Kanmuri-yoji”
Distribution in Japan: Yaeyama Group (Senou & Suzuki, 1980a), north to Wakayama Prefecture (Nakabo, 2000).
- **Microphis (Coelonotus) argulus* (Peters) “Hoshi-issen-yoji”
Distribution in Japan: North to Iriomote Island (Senou *et al.*, 1995).
- Microphis (Coelonotus) leiaspis* (Bleeker) “Issen-yoji”
Distribution in Japan: Ishigaki, Okinawa, Amami-ohshima, Tanegashima and Yaku-shima islands (present study), north to Sagami Bay (Nakabo, 2000).
Salinity: 17.7–8,960 ppm.
Specimens examined: NSMT-P 15989, 28545, 28558, 28637, 28810, 28893, 28910, 29128, 29161.
- **Microphis (Lophocampus) retzii* (Bleeker) “Tani-yoji”
Distribution in Japan: North to Iriomote Island (Yoshino & Yoshigou, 1998).
- Microphis (Oostethus) brachyurus brachyurus* (Bleeker) “Tengu-yoji”
Distribution in Japan: Ishigaki, Okinawa, Amami-ohshima, Tanegashima and Yaku-shima islands (present study), north to Sagami Bay (Nakabo, 2000).
Salinity: 36.0–21,900 ppm.
Specimens examined: NSMT-P 15893, 15902, 15927, 15987, 28534, 28546, 28559, 28570, 28580, 28744, 28894, 28911, 29014, 29112, 29162.
- **Microphis (Oostethus) jagorii* Peters “Hime-tengu-yoji”
Distribution in Japan: North to Okinawa Island (Yoshino & Yoshigou, 1998).

**Urocampus carinirostris* Castelnan “Minami-oku-yoji”

Distribution in Japan: North to Iriomote Island (Nakabo, 2000).

Tetrarogidae

**Tetraroge barbata* (Cuvier) “Agohige-okoze”

Distribution in Japan: North to Iriomote Island (Senou & Suzuki, 1981a).

**Tetraroge niger* (Cuvier) “Higesori-okoze”

Distribution in Japan: North to Iriomote Island (Nakabo, 2000).

Synbranchidae

Monopterus albus (Zuiew) “Ta-unagi”

Distribution in Japan: Okinawa Island (present study), Ishigaki and Amami-ohshima islands (Kochi, 1991).

Salinity: 41.0–48.2 ppm.

Specimens examined: NSMT-P 28800, 29283.

Note: Probably introduced (Kochi, 1991). The Okinawa population of this species is listed as vulnerable (VU) in the Red Data report by Okinawa Prefecture (1996) and as threatened local population (LP) in the Red List by the Japan Environmental Agency (1999).

Scorpaenidae

**Scorpaenodes guamensis* Quoy et Gaimard “Guamu- kasago”

Distribution in Japan: Yaeyama Group (Senou & Suzuki, 1980a), north to Hachijo Island (Nakabo, 2000).

Platycephalidae

Cociella crocodila (Tilesius) “Ine-gochi”

Distribution in Japan: Iriomote Island (present study), north to southern Japan (Nakabo, 2000).

Salinity: 16,500 ppm.

Specimens examined: NSMT-P 29286.

Platycephalus sp. 2 “Ma-gochi”

Distribution in Japan: Tanegashima Island (present study) to southern Japan (Nakabo, 2000).

Salinity: 2,000 ppm.

Specimens examined: NSMT-P 29277.

Latidae****Lates japonicus* Katayama et Taki “Akame”**

Distribution in Japan: Tanegashima Island to Hamanako Lake (Nakabo, 2000).

Ambassidae****Ambassis buruensis* Bleeker “Togenaga-takasago-ishimochi”**

Distribution in Japan: North to Ryukyu Archipelago (Nakabo, 2000).

***Ambassis commersoni* Cuvier “Hanadaka-takasago-ishimochi”**

Distribution in Japan: Iriomote Island (present study), north to Ryukyu Archipelago (Nakabo, 2000).

Salinity: 133 ppm.

Specimens examined: NSMT-P 28366.

***Ambassis interrupta* Bleeker “Nanyo-takasago-ishimochi”**

Distribution in Japan: Yaeyama Group (present study), north to Amami-ohshima Island (Hayashi *et al.*, 1992).

Salinity: 133–2,110 ppm.

Specimens examined: NSMT-P 15833, 15894, 15964, 28365.

***Ambassis miops* Güther “Sesuji-takasago-ishimochi”**

Distribution in Japan: Yaeyama Group (present study), north to Ryukyu Archipelago (Nakabo, 2000).

Salinity: 133–34,300 ppm.

Specimens examined: NSMT-P 28367, 28387, 28504, 29270.

***Ambassis urotaenia* Bleeker “Takasago-ishimochi”**

Distribution in Japan: Ishigaki, Iriomote and Yaku-shima islands (present study), north to Sagami Bay (Nakabo, 2000).

Salinity: 15.9–16,500 ppm.

Specimens examined: NSMT-P 15858, 15990, 28343, 29064, 29113, 29271, 29272.

Note: *Ambassis urotaenia* is probably a junior synonym of *A. miops* (Yoshigou & Yoshino, 1998).

Perciichthyidae***Lateolabrax latus* Katayama “Hira-suzuki”**

Distribution in Japan: Tanegashima Island (present study) to Boso Peninsula (Nakamura, 1963; Sakai *et al.*, 1998).

Salinity: 48.6 ppm.

Specimens examined: NSMT-P 29234.

Serranidae

**Epinephelus caeruleopunctatus* (Bloch) “Hakuten-hata”

Distribution in Japan: North to southern Japan (Kawanabe & Mizuno, 1989; Nakabo, 2000).

**Epinephelus coioides* (Hamilton) “Chairo-maru-hata”

Distribution in Japan: North to Ryukyu Archipelago (Kawanabe & Mizuno, 1989; Nakabo, 2000).

**Epinephelus maculatus* (Bloch) “Shiro-buchi-hata”

Distribution in Japan: Iriomote Island (Senou & Suzuki, 1981b), north to southern Japan (Nakabo, 2000).

**Epinephelus malabaricus* (Bloch et Schneider) “Yaito-hata”

Distribution in Japan: Ishigaki Island (Senou & Suzuki, 1981a), north to Ryukyu Archipelago (Nakabo, 2000).

**Epinephelus ongus* (Bloch) “Nami-hata”

Distribution in Japan: North to Ryukyu Archipelago (Kawanabe & Mizuno, 1989; Nakabo, 2000).

Plesiopidae

**Plesiops coeruleolineatus* Rüpell “Tanabata-uo”

Distribution in Japan: Amami-ohshima Island (Hayashi *et al.*, 1992), north to southern Japan (Nakabo, 2000).

Terapontidae

**Mesopristes argenteus* (Cuvier) “Nise-shima-isaki”

Distribution in Japan: North to Yaeyama Group (Senou & Suzuki, 1980a).

Note: Sakai & Sato (1982) misidentified this species as *M. kneri*. This species is listed as endangered (EN) in the Red List by the Japan Environmental Agency (1999).

**Mesopristes cancellatus* (Cuvier) “Yokoshima-isaki”

Distribution in Japan: North to Yaeyama Group (Senou & Suzuki, 1980a).

Note: This species is listed as endangered (EN) in the Red List by the Japan Environmental Agency (1999).

**Mesopristes* sp. “Shimizu-shima-isaki”

Distribution in Japan: Yaeyama Group (Nakabo, 2000).

Note: This species is listed as endangered (EN) in the Red List by the Japan Environmental Agency (1999).

Terapon jarbua (Forsskål) “Kotohiki”

Distribution in Japan: Ishigaki, Iriomote, Okinawa, Amami-ohshima and Tane-gashima islands (present study), north to southern Japan (Nakabo, 2000).

Salinity: 49.1–35,200 ppm.

Specimens examined: NSMT-P 15783, 15819, 15834, 15903, 15991, 20924, 28234, 28247, 28331, 28454, 28661, 28689, 28735, 28811, 28945, 29004, 29016, 29142, 29152, 29190, 29205, 29257.

Kuhliidae

Kuhlia marginata (Cuvier) “Yugoi”

Distribution in Japan: Ishigaki, Iriomote, Okinawa, Amami-ohshima, Tanegashima and Yaku-shima islands (present study), north to southern Japan (Nakabo, 2000).

Salinity: 15.9–1,900 ppm.

Specimens examined: NSMT-P 15758, 15792, 15800, 15895, 15914, 15919, 15947, 15992, 28141, 28156, 28207, 28219, 28261, 28266, 28311, 28370, 28388, 28437, 28483, 28522, 28528, 28535, 28548, 28560, 28572, 28583, 28638, 28655, 28681, 28698, 28706, 28788, 28902, 28912, 28996, 29017, 29037, 29042, 29058, 29103, 29114, 29129, 29163, 29172, 29184, 29226, 29235, 29264, 29343, 29403, 29449.

Kuhlia boninensis (Fowler) “Togenaga-yugoi”

Distribution in Japan: Ishigaki, Iriomote and Amami-ohshima islands (present study), Ogasawara islands, north to Yaku-shima Island (Kawanabe & Mizuno, 1989; Nakabo, 2000).

Salinity: 58.2–977 ppm.

Specimens examined: NSMT-P 28143, 28529, 29018, 29278, 29311.

Kuhlia rupestris (Lacepède) “Ohkuchi-yugoi”

Distribution in Japan: Ishigaki, Iriomote and Okinawa islands (present study), north to Kochi Prefecture (Takahashi & Senou, 1995).

Salinity: 52.2–977 ppm.

Specimens examined: NSMT-P 15759, 15793, 15915, 15946, 15948, 15993, 28142, 28229, 28371, 28389, 28408, 28438, 28521, 28573.

Centrarchidae

Lepomis macrochirus Rafinesque “Buru-giru”

Distribution in Japan: Okinawa Island (present study).

Salinity: 55.8 ppm.

Specimens examined: NSMT-P 29302.

Note: Introduced from North America in 1963 (Kochi, 1991).

**Micropterus salmoides* (Lacepède) “Burakku-basu”

Distribution in Japan: Okinawa Island (Kochi, 1991).

Note: Introduced from North America in 1963 (Kochi, 1991).

Apogonidae

Apogon amboinensis Bleeker “Amami-ishimochi”

Distribution in Japan: Yaeyama Group (present study), north to Amami-ohshima Island (Nakabo, 2000).

Salinity: 58.2–30,000 ppm.

Specimens examined: NSMT-P 15861, 15963, 28180, 28278, 28344, 28372, 28484, 28505, 28525.

**Apogon bandanensis* Bleeker “Banda-ishimochi”

Distribution in Japan: Yaeyama Group (Senou & Suzuki, 1980a), north to Okinawa Island (Nakabo, 2000).

**Apogon hyalosoma* Bleeker “Kagami-tenjiku-dai”

Distribution in Japan: North to Iriomote Island (Nakabo, 2000).

**Sphaeramia orbicularis* (Kuhl et van Hasselt) “Hososuji-manjiu-ishimochi”

Distribution in Japan: North to Iriomote Island (Nakabo, 2000).

Sillaginidae

**Sillago sihama* (Forsskål) “Moto-gisu”

Distribution in Japan: Iriomote Island (Senou & Suzuki, 1980b), north to Okinawa Island (Nakabo, 2000).

Sillago aeolus Jordan et Evermann “Hoshi-gisu”

Distribution in Japan: North to Amami-ohshima Island (present study; Nakabo, 2000).

Salinity: 12,800 ppm.

Specimens examined: NSMT-P 28946.

Carangidae

Caranx ignobilis (Forsskål) “Rounin-aji”

Distribution in Japan: Ishigaki, Iriomote, Okinawa, Amami-ohshima and Tanegashima islands (present study), north to southern Japan (Nakabo, 2000).

Salinity: 287–35,200 ppm.

Specimens examined: NSMT-P 15880, 28181, 28561, 28746, 28837, 54397, 54399, 54400, 54403, 54405, 54408.

**Caranx melampygus* Cuvier “Kasumi-aji”

Distribution in Japan: Ishigaki Island (Senou & Suzuki, 1981b), north to southern Japan (Nakabo, 2000).

Caranx papuensis Alleyne et Macleay “Onihira-aji”

Distribution in Japan: Ishigaki, Okinawa and Amami-ohshima islands (present study), north to southern Japan (Nakabo, 2000).

Salinity: 287–21,900 ppm.

Specimens examined: NSMT-P 54395, 54396, 54398, 54401, 54402, 54404,

54406, 54407.

Caranx sexfasciatus Quoy et Gaimard “Gingame-aji”

Distribution in Japan: Ishigaki, Iriomote, Okinawa, Amami-ohshima and Tanegashima islands (present study), north to southern Japan (Nakabo, 2000).

Salinity: 36.0–35,200 ppm.

Specimens examined: NSMT-P 28345, 28536, 28584, 28600, 28778, 28812, 28913, 28947, 29019, 29258, 15994.

**Scomberoides tol* (Cuvier) “Minami-ike-katsuo”

Distribution in Japan: Iriomote Island (Senou & Suzuki, 1981a), north to Wakayama Prefecture (Nakabo, 2000).

Leiognathidae

Leiognathus equulus (Forsskål) “Seitaka-hiiragi”

Distribution in Japan: Ishigaki, Iriomote, Okinawa, north to Amami-ohshima islands (present study; Nakabo, 2000).

Salinity: 3,600–8,960 ppm.

Specimens examined: NSMT-P 15952, 28319, 28813, 28948, 29329.

Leiognathus fasciatus (Lacepède) “Shima-hiiragi”

Distribution in Japan: Iriomote Island (present study), north to Ryukyu Archipelago (Nakabo, 2000).

Salinity: No data.

Specimens examined: NSMT-P 28320.

**Leiognathus splendens* (Cuvier) “Taiwan-hiiragi”

Distribution in Japan: North to Ryukyu Archipelago (Nakabo, 2000).

Lutjanidae

Lutjanus argentimaculatus (Forsskål) “Goma-fue-dai”

Distribution in Japan: Ishigaki, Iriomote, Okinawa and Amami-ohshima islands (present study), north to southern Japan (Nakabo, 2000).

Salinity: 36.0–24,400 ppm.

Specimens examined: NSMT-P 15803, 15896, 15959, 15966, 15995, 28144, 28182, 28248, 28279, 28329, 28332, 28373, 28390, 28404, 28416, 28527, 28549, 28562, 28663, 28914, 28949, 29020.

Lutjanus fulviflamma (Forsskål) “Nise-kurohoshi-fue-dai”

Distribution in Japan: Ishigaki, Iriomote, Okinawa and Tanegashima islands (present study), north to Wakayama Prefecture (Nakabo, 2000).

Salinity: 862–35,200 ppm.

Specimens examined: NSMT-P 15882, 15996, 28118, 28158, 28346, 28461, 28586, 28737, 28748, 29261, 29303.

Lutjanus fulvus (Schneider) “Oki-fue-dai”

Distribution in Japan: Ishigaki, Iriomote, Okinawa, Amami-ohshima and Tanegashima islands (present study), north to southern Japan (Nakabo, 2000).

Salinity: 210–35,200 ppm.

Specimens examined: NSMT-P 15753, 15782, 15802, 15883, 28116, 28183, 28460, 28485, 28507, 28537, 28585, 28747, 28814, 28950, 29005, 29021, 29144, 29260, 29344, 15997.

**Lutjanus goldiei* (Macleay) “Urauchi-fue-dai”

Distribution in Japan: North to Iriomote Island (Senou & Suzuki, 1992; Nakabo, 2000).

Note: This species is listed as critically endangered (CR) in the Red List by the Japan Environmental Agency (1999).

**Lutjanus kasmira* (Forsskål) “Yosuji-fue-dai”

Distribution in Japan: Amami-ohshima Island (Hayashi *et al.*, 1992), north to southern Japan (Nakabo, 2000).

Lutjanus monostigma (Cuvier) “Itten-fue-dai”

Distribution in Japan: Ishigaki Island (present study), north to Wakayama Prefecture, 2000).

Salinity: 862–16,000 ppm.

Specimens examined: NSMT-P 15881, 28159.

**Lutjanus rivulatus* (Cuvier) “Nami-fue-dai”

Distribution in Japan: North to Kochi Prefecture (Nakabo, 2000).

Lutjanus russellii (Bleeker) (Pl. 6E) “Kurohoshi-fue-dai”

Distribution in Japan: Ishigaki, Iriomote, Amami-ohshima and Tanegashima islands (present study), north to southern Japan (Nakabo, 2000).

Salinity: 770–34,300 ppm.

Specimens examined: NSMT-P 28117, 28321, 29022, 29345.

**Lutjanus quinquelineatus* (Bloch) “Rokusen-fue-dai”

Distribution in Japan: Ishigaki Island (Senou & Suzuki, 1981a), north to southern Japan (Nakabo, 2000).

Lutjanus stellatus Akazaki “Fue-dai”

Distribution in Japan: Tanegashima Island (present study), north to southern Japan (Nakabo, 2000).

Salinity: 35,200 ppm.

Specimens examined: NSMT-P 29259.

**Lutjanus vitta* (Quoy et Gaimard) “Tate-fue-dai”

Distribution in Japan: Ishigaki Island (Hayashi *et al.*, 1981a), north to Ryukyu Archipelago (Iwatsuki *et al.*, 1993; Nakabo, 2000).

Lobotidae

Lobotes surinamensis (Bloch) “Matsudai”

Distribution in Japan: Okinawa Island (present study), north to southern Japan (Nakabo, 2000).

Salinity: 8,960 ppm.

Specimens examined: NSMT-P 28815, 29330.

Gerreidae

Gerres erythrourus (Bloch) “Seppari-sagi”

Distribution in Japan: Iriomote Island (present study), north to Ryukyu Archipelago (Nakabo, 2000).

Salinity: 30,000 ppm.

Specimens examined: NSMT-P 28322, 28508, 29287.

Note: *Gerres erythrourus* is a senior synonym of *G. abbreviatus* (Iwatsuki *et al.*, 1998).

Gerres acinaces Bleeker “Tsuppari-sagi”

Distribution in Japan: Iriomote Island (present study; Sakai & Sato, 1982), north to Ryukyu Archipelago (Nakabo, 2000).

Salinity: No data.

Specimens examined: NSMT-P 28323.

Gerres filamentosus Cuvier “Itohiki-sagi”

Distribution in Japan: Ishigaki and Tanegashima islands (present study), north to southern Japan (Nakabo, 2000).

Salinity: 150–3,600 ppm.

Specimens examined: NSMT-P 15999, 29143, 29154.

**Gerres macracanthus* (Bleeker) “Hoso-itohiki-sagi”

Distribution in Japan: North to Iriomote Island (Iwatsuki *et al.*, 1996).

Gerres sp.

Distribution in Japan: Ishigaki, Iriomote and Tanegashima islands (present study).

Salinity: 210–34,300 ppm.

Specimens examined: NSMT-P 15739, 15751, 15798, 15799, 15820, 15835, 15852, 15863, 15864, 15884, 15904, 15998, 16000, 28119, 28145, 28160, 28184, 28271, 28347, 28427, 28455, 28462, 28463, 28486, 28509, 29338.

Note: According to Iwatsuki *et al.* (1999), the *G. oyena* complex is still taxonomically confused, but at least 3 specimens of NSMT-P 28119, 3 specimens of 28145, and all 5 specimens of 28509 were identifiable as *G. oyena* (Dr. Y. Iwatsuki, pers. com.).

Haemulidae

**Hapalogenys nitens* Richardson “Higesori-dai”

Distribution in Japan: Amami-ohshima Island (Hayashi *et al.*, 1992) to Shimo-

kita Peninsula (Nakabo, 2000).

Plectorhinchus gibbosus (Lacepède) “Kuro-koshoudai”

Distribution in Japan: Ishigaki, Iriomote, north to Amami-ohshima islands (present study; Nakabo, 2000).

Salinity: 12,800–24,400 ppm.

Specimens examined: NSMT-P 15960, 28417, 28951, 29288.

Pomadasys argenteus (Forsskål) “Hoshi-mizo-isaki”

Distribution in Japan: Ishigaki, Iriomote and Amami-ohshima islands (present study), north to Kochi Prefecture (Nakabo, 2000).

Salinity: No data.

Specimens examined: NSMT-P 28324.

Sparidae

Acanthopagrus berda (Forsskål) “Nanyou-chinu”

Distribution in Japan: North to Iriomote Island (present study; Akazaki, 1989).

Salinity: 2,260 ppm.

Specimens examined: NSMT-P 28313.

Acanthopagrus schlegeli (Bleeker) “Kuro-dai”

Distribution in Japan: Tanegashima Island (present study) to Hokkaido (Akazaki, 1989).

Salinity: 6,920–35,200 ppm.

Specimens examined: NSMT-P 29208, 29262.

Acanthopagrus sivicolus Akazaki “Minami-kuro-dai”

Distribution in Japan: Ishigaki, Iriomote, Okinawa and Amami-ohshima islands (present study).

Salinity: 38.5–38,700 ppm.

Specimens examined: NSMT-P 15752, 15961, 28120, 28249, 28272, 28325, 28738, 28750, 28790, 28838, 28884, 28895, 28934, 28952, 29006, 29023.

Note: Endemic to Amami Group and Ryukyu Archipelago (Akazaki, 1989; Nakabo, 2000).

Mullidae

**Mulloidichthys flavolineatus* (Lacepède) “Montsuki-aka-himeji”

Distribution in Japan: Amami-ohshima Island (Hayashi *et al.*, 1992), north to Wakayama Prefecture (Nakabo, 2000).

**Parupeneus ciliatus* (Lacepède) “Hourai-himeji”

Distribution in Japan: Amami-ohshima Island (Hayashi *et al.*, 1992), north to southern Japan (Nakabo, 2000).

**Upeneus tragula* Richardson “Yome-himeji”

Distribution in Japan: Amami-ohshima Island (Hayashi *et al.*, 1992), north to

southern Japan (Nakabo, 2000).

Upeneus vittatus (Forsskål) “Minami-himeji”

Distribution in Japan: Iriomote Island (present study), north to Kochi Prefecture (Nakabo, 2000).

Salinity: No data.

Specimens examined: NSMT-P 28326.

Monodactylidae

Monodactylus argenteus (Linnaeus) “Hime-tsubameuo”

Distribution in Japan: Yaeyama Group (present study), north to Miyako Island (Nakabo, 2000).

Salinity: 153–34,300 ppm.

Specimens examined: NSMT-P 15836, 15865, 15917, 16001, 16016, 28121, 28280.

Girellidae

**Girella mezinga* Jordan et Starks “Okina-mejinga”

Distribution in Japan: Yaeyama Group (Senou & Suzuki, 1980a) to Chiba Prefecture (Okamura & Amaoka, 1997).

Toxotidae

**Toxotes jaculatorix* (pallas) “Teppou-uo”

Distribution in Japan: North to Iriomote Island (Senou & Suzuki, 1981a).

Scatophagidae

Scatophagas argus (Linnaeus) “Kurohoshi-manju-dai”

Distribution in Japan: Ishigaki Island (present study), north to Wakayama Prefecture (Nakabo, 2000).

Salinity: 34,300 ppm.

Specimens examined: NSMT-P 29298, 29331.

Chaetodontidae

**Chaetodon lineolatus* Cuvier “Nise-furai-chouchou-uo”

Distribution in Japan: Amami-ohshima Island (Hayashi *et al.*, 1992), north to Sagami Bay (Nakabo, 2000).

**Chaetodon lunula* (Lacepède) “Chouhan”

Distribution in Japan: Amami-ohshima Island (Hayashi *et al.*, 1992), north to Chiba Prefecture (Nakabo, 2000).

**Chaetodon vagabundus* Linnaeus “Furai-chouchou-uo”

Distribution in Japan: Yaeyama Group (Hayashi *et al.*, 1981a; Senou & Suzuki, 1981a), north to Chiba Prefecture (Nakabo, 2000).

Heniochus acuminatus (Linnaeus) “Hatatate-dai”

Distribution in Japan: Okinawa Island (present study), Iriomote Island (Senou & Suzuki, 1981a), north to Aomori Prefecture (Nakabo, 2000).

Salinity: 30,200 ppm.

Specimens examined: NSMT-P 29331.

Cichlidae*Oreochromis mossambicus* (Peters) “Kawa-suzume”

Distribution in Japan: Ishigaki, Iriomote, Okinawa and Amami-ohshima islands (present study).

Salinity: 41.0–22,800 ppm.

Specimens examined: NSMT-P 15922, 15937, 15941, 15945, 16002, 28215, 28220, 28316, 28611, 28664, 28690, 28779, 28791, 28864.

Note: Introduced in 1954 (Kochi, 1991).

**Oreochromis niloticus* (Linnaeus) “Chika-dai”

Distribution in Japan: Okinawa Island (Kochi, 1991).

Note: Introduced in the 1960s (Kochi, 1991).

Pomacentridae**Abudefduf sexfasciatus* (Lacepède) “Rokusen-suzume-dai”

Distribution in Japan: Iriomote Island (Senou & Suzuki, 1981a), north to Shizuoka Prefecture (Nakabo, 2000).

**Abudefduf sordidus* Forsskål “Shima-suzume-dai”

Distribution in Japan: Yaeyama Group (Senou & Suzuki, 1980a), north to Chiba Prefecture (Nakabo, 2000).

Abudefduf vaigiensis (Quoy et Gaimard) “Oyabiccha”

Distribution in Japan: Okinawa Island (present study), north to Chiba Prefecture (Nakabo, 2000).

Salinity: 8,960 ppm.

Specimens examined: NSMT-P 28817.

**Chrysiptera glauca* (Cuvier) “Nezu-suzume-dai”

Distribution in Japan: Yaeyama Group (Senou & Suzuki, 1980a), north to Wakayama Prefecture (Nakabo, 2000).

**Neopomacentrus taeniurus* (Bleeker) “Ribon-suzume-dai”

Distribution in Japan: North to Ryukyu Archipelago (Nakabo, 2000).

**Pomacentrus bankanensis* Bleeker “Megane-suzume-dai”

Distribution in Japan: Iriomote Island, Amami-ohshima Island (Hayashi *et al.*,

1981a, 1992), north to Ryukyu Archipelago (Nakabo, 2000).

**Pomacentrus moluccensis* Bleeker “Nettai-suzume-dai”

Distribution in Japan: Iriomote Island (Hayashi *et al.*, 1981a), north to Ryukyu Archipelago (Nakabo, 2000).

Pomacentrus taeniometopon Bleeker “Sumizome-suzume-dai”

Distribution in Japan: Ishigaki, Iriomote, north to Okinawa islands (present study; Nakabo, 2000).

Salinity: 41.0–30,200 ppm.

Specimens examined: NSMT-P 15967, 28185, 28434, 28538, 28751, 28792, 28803, 28816.

Mugilidae

Chelon affinis (Güther) “Sesuji-bora”

Distribution in Japan: Ishigaki, Iriomote, Okinawa, Amami-ohshima and Tanegashima islands (present study), north to Hokkaido (Senou, 1989; Nakabo, 2000).

Salinity: 47.3–34,300 ppm.

Specimens examined: NSMT-P 15735, 15749, 15838, 15854, 15885, 15906, 16005, 28123, 28201, 28209, 28251, 28282, 28563, 28575, 28588, 28613, 28620, 28666, 28753, 28802, 28819, 28839, 28851, 28953, 29039, 29045, 29156, 29192, 29210, 29244, 29347, 15839-1.

Chelon macrolepis (Smith) “Ko-bora”

Distribution in Japan: Ishigaki, Iriomote, Okinawa, Amami-ohshima and Tanegashima islands (present study), north to Chiba Prefecture (Nakabo, 2000).

Salinity: 48.2–34,300 ppm.

Specimens examined: NSMT-P 15736, 15750, 15757, 15780, 15855, 15859, 15867, 15876, 15897, 15907, 15929, 20910, 20920, 28124, 28147, 28161, 28230, 28236, 28252, 28283, 28300, 28334, 28349, 28375, 28439, 28464, 28475, 28510, 28614, 28621, 28667, 28677, 28739, 28754, 28852, 29008, 29026, 15839-2.

Chelon melinopterus (Valenciennes) “Hirugi-menada”

Distribution in Japan: Ishigaki, Iriomote, north to Amami-ohshima islands (present study; Nakabo, 2000).

Salinity: 9,520–32,700 ppm.

Specimens examined: NSMT-P 28186, 28465, 28954.

**Chelon subviridis* (Valenciennes) “Anpin-bora”

Distribution in Japan: North to Ryukyu Archipelago (Nakabo, 2000).

Crenimugil crenilabis (Forsskål) “Furai-bora”

Distribution in Japan: Iriomote Island (present study), north to Chiba Prefecture (Nakabo, 2000).

Salinity: 1,390 ppm.

Specimens examined: NSMT-P 28238.

**Crenimugil heterocheilus* (Bleeker) “Nagare-furai-bora”

Distribution in Japan: North to Yaeyama Group (Nakabo, 2000).

Note: This species is listed as vulnerable (VU) in the Red List by the Japan Environmental Agency (1999).

Ellochelon vaigiensis (Rüpell) “Oni-bora”

Distribution in Japan: Iriomote and Tanegashima islands (present study), north to Wakayama Prefecture (Nakabo, 2000).

Salinity: 2,000–15,800 ppm.

Specimens examined: NSMT-P 28457, 29316, 29348.

**Moolgarda engeli* (Bleeker) “Mon-nashi-bora”

Distribution in Japan: North to Yaeyama Group (Nakabo, 2000).

Moolgarda pedaraki (Valenciennes) “Kamahire-bora”

Distribution in Japan: Ishigaki, Iriomote, Amami-ohshima, north to Tanegashima islands (present study; Nakabo, 2000).

Salinity: 47.3–12,800 ppm.

Specimens examined: NSMT-P 16004, 20923, 28187, 28440, 28955, 29145, 29157.

Moolgarda perusii (Valenciennes) “Nanyo-bora”

Distribution in Japan: Iriomote Island (present study), north to Tokyo Bay (Nakabo, 2000).

Salinity: 2,260 ppm.

Specimens examined: NSMT-P 28314.

Moolgarda seheli (Forsskål) “Taiwan-menada”

Distribution in Japan: Yaeyama Group (present study), north to Wakayama Prefecture (Nakabo, 2000).

Salinity: 1,390–34,300 ppm.

Specimens examined: NSMT-P 15737, 15781, 15868, 15886, 15908, 28125, 28237.

Mugil cephalus cephalus Linnaeus “Bora”

Distribution in Japan: Ishigaki, Iriomote, Okinawa, Amami-ohshima, Tanegashima and Yaku-shima islands (present study), north to Hokkaido (Nakabo, 2000).

Salinity: 34.3–38,700 ppm.

Specimens examined: NSMT-P 15734, 15756, 15837, 15853, 15866, 15905, 15921, 15928, 16003, 20922, 20927, 28122, 28146, 28208, 28235, 28250, 28281, 28292, 28333, 28348, 28374, 28405, 28418, 28456, 28574, 28587, 28601, 28612, 28619, 28639, 28656, 28665, 28682, 28699, 28726, 28752, 28780, 28793, 28818, 28840, 28850, 28868, 28885, 28896, 28915, 28935, 28974, 28998, 29007, 29025, 29038, 29044, 29097, 29104, 29115, 29155,

29165, 29173, 29185, 29191, 29209, 29236, 29243, 29346.

**Oedalechilus labiosus* (Valenciennes) “Waniguchi-bora”

Distribution in Japan: Amami-ohshima Island (Hayashi *et al.*, 1992), north to Chiba Prefecture (Nakabo, 2000).

Polynemidae

Polydactylus plebeius (Broussonet) “Tsubame-konoshiro”

Distribution in Japan: Okinawa Island (present study), north to southern Japan (Nakabo, 2000).

Salinity: 1,090 ppm.

Specimens examined: NSMT-P 29322.

Labridae

**Labroides dimidiatus* (Valenciennes) “Hon-somewake-bera”

Distribution in Japan: Iriomote Island (Senou & Suzuki, 1981a), north to Chiba Prefecture (Nakabo, 2000).

Pinguipedidae

**Parapercis cylindrica* (Bloch) “Dandara-toragisu”

Distribution in Japan: Ishigaki Island (Hayashi *et al.*, 1981a), north to Ryukyu Archipelago (Nakabo, 2000).

Blenniidae

Meiacanthus grammistes (Valenciennes) “Hige-niji-ginpo”

Distribution in Japan: Iriomote Island (present study), north to Kochi Prefecture (Hirata *et al.*, 1996).

Salinity: 30,000 ppm.

Specimens examined: NSMT-P 29290.

**Omobranchus elongatus* (Peters) “Goma-kumo-ginpo”

Distribution in Japan: North to Iriomote Island (Aizawa & Senou, 1992).

**Omobranchus ferox* (Herre) “Kawa-ginpo”

Distribution in Japan: North to Iriomote Island (Senou & Suzuki, 1980b).

**Omobranchus loxozonus* (Jordan et Snyder) “Kumo-ginpo”

Distribution in Japan: Yaeyama Group (Senou & Suzuki, 1980a) to Kii Peninsula (Nakabo, 2000).

**Omx biporos* Springer “Hirugi-ginpo”

Distribution in Japan: North to Yaeyama Group (Senou & Suzuki, 1980b).

**Petroscirtes breviceps* (Valenciennes) “Niji-ginpo”

Distribution in Japan: Amami-ohshima Island (Hayashi *et al.*, 1992), north to

Shimokita Peninsula (Nakabo, 2000).

**Salaria luctuosus* Whitley “Shima-ginpo”

Distribution in Japan: Yaeyama Group (Senou & Suzuki, 1980a), north to Kii Peninsula (Nakabo, 2000).

Rhyacichthyidae

**Rhyacichthys aspro* (Valenciennes) “Tsubasa-haze”

Distribution in Japan: North to Yaeyama Group (Nakabo, 2000).

Note: This species is listed as rare (R) in the Red Data report by Okinawa Prefecture (1996), as vulnerable (VU) in the Data Book by the Japan Fisheries Agency (1998), and as endangered (EN) in the Red List by the Japan Environmental Agency (1999).

Eleotridae

**Belobranchus belobranchus* (Valenciennes) “Eri-toge-haze”

Distribution in Japan: North to Iriomote Island (Suzuki *et al.*, 1995).

Bostrychus sinensis Lacepède “Janome-haze”

Distribution in Japan: Ishigaki, Iriomote, Okinawa islands (present study), north to Amami-ohshima Island (Kawanabe & Mizuno, 1989).

Salinity: 79.1–34,300 ppm.

Specimens examined: NSMT-P 15754, 15785, 15812, 15887, 15898, 28126, 28293, 28441, 28476, 28488, 28757, 29279.

Note: This species is listed as vulnerable (VU) by the Japan Environmental Agency (1999).

**Butis amboinensis* (Bleeker) “Yaeyama-nokogiri-haze”

Distribution in Japan: North to Yaeyama Group (Hayashi *et al.*, 1981b; Nakabo, 2000).

Note: This species is listed as vulnerable (VU) in the Red List by the Japan Environmental Agency (1999).

Eleotris acanthopoma Bleeker “Chichibu-modoki”

Distribution in Japan: Ishigaki, Iriomote, Okinawa, Amami-ohshima and Tanegashima islands (present study), north to Chiba Prefecture, Ogasawara Islands (Nakabo, 2000).

Salinity: 34.3–38,700 ppm.

Specimens examined: NSMT-P 15740, 15760, 15786, 15804, 15821, 15841, 15856, 15899, 15930, 15981, 16006, 20921, 28127, 28189, 28202, 28231, 28240, 28254, 28262, 28284, 28294, 28301, 28336, 28351, 28360, 28376, 28392, 28419, 28442, 28466, 28477, 28489, 28539, 28551, 28576, 28590, 28615, 28622, 28668, 28727, 28758, 28781, 28794, 28853, 28886, 28897, 28958, 28999, 29009, 29027, 29046, 29147, 29166, 29186, 29194, 29245,

29349.

Eleotris fusca (Bloch et Schneider) “Tenjiku-Kawa-anago”

Distribution in Japan: Iriomote, Okinawa and Amami-ohshima islands (present study), north to Shizuoka Prefecture (Nakabo, 2000).

Salinity: 36.9–1,780 ppm.

Specimens examined: NSMT-P 28227, 28244, 28263, 28267, 28377, 28490, 28640, 28683, 28700, 28782, 28795, 28865, 28987, 29304.

Eleotris melanosoma Bleeker “Okame-haze”

Distribution in Japan: Ishigaki, Iriomote, Okinawa and Amami-ohshima islands (present study), north to Shizuoka Prefecture (Nakabo, 2000).

Salinity: 43.5–34,300 ppm.

Specimens examined: NSMT-P 15942, 15982, 28128, 28302, 28393, 28420, 28540, 28616, 28759, 28796, 28929.

**Eleotris oxycephala* Temminck et Schlegel “Kawa-anago”

Distribution in Japan: Amami-ohshima Island (Shokita *et al.*, 1989), Tanegashima Island (Nakabo, 2000) to Matsushima Bay (Nakamura, 1963).

Hypseleotris cyprinoides (Valenciennes) “Tanago-modoki”

Distribution in Japan: Yaeyama Group (present study), north to Wakayama Prefecture (Yamamoto *et al.*, 1997).

Salinity: 43.5–133 ppm.

Specimens examined: NSMT-P 15949, 15983, 28378, 28394, 29386.

Note: This species is listed as vulnerable (VU) in the Red Data report by Okinawa Prefecture (1996) and in the Data Book by the Japan Fisheries Agency (1998), and as endangered (EN) in the Red List by the Japan Environmental Agency (1999).

Ophieleotris sp. “Tametomo-haze”

Distribution in Japan: Yaeyama Group (present study), north to Yaku-shima Island (Nakabo, 2000).

Salinity: 116–120 ppm.

Specimens examined: NSMT-P 28228, 28232, 29280.

Note: This species is listed as endangered (EN) in the Red List by the Japan Environmental Agency (1999).

Ophiocara porocephala (Valenciennes) “Hoshi-madara-haze”

Distribution in Japan: Yaeyama Group (present study), north to Miyako Island (Nakabo, 2000).

Salinity: 133–30,000 ppm.

Specimens examined: NSMT-P 15813, 15815, 28149, 28330, 28379, 28395, 28409, 28410, 28411, 28421, 28511, 29291, 29317.

Gobiidae

Acanthogobius flavimanus (Temminck et Schlegel) “Ma-haze”

Distribution in Japan: Tanegashima Island (present study) to Hokkaido (Nakabo, 2000).

Salinity: 6,920 ppm.

Specimens examined: NSMT-P 29222, 29340.

Acanthogobius insularis Shibukawa et Taki “Minami-ashishiro-haze”

Distribution in Japan: Okinawa and Amami-ohshima islands (present study; Shibukawa & Taki, 1996).

Salinity: 1,090–12,800 ppm.

Specimens examined: NSMT-P 28397, 28624, 28842, 28937, 28966, 29367.

Note: The specimens recorded as *A. lactipes* from the Ryukyu Archipelago by Hayashi *et al.* (1992) and Akihito *et al.* (1993) were subsequently described as *A. insularis* by Shibukawa & Taki (1996). Specimens NSMT-P 28624, 28842, 28937 and 28966 are paratypes of the latter species (Shibukawa & Taki, 1996), which is listed as vulnerable (VU) in the Red List by the Japan Environmental Agency (1999).

**Acentrogobius audax* Smith “Nise-tsumugi-haze”

Distribution in Japan: Yaeyama Group (Suzuki & Senou, 1982), north to Miyako Island (Nakabo, 2000).

**Acentrogobius caninus* (Valenciennes) “Hokuro-haze”

Distribution in Japan: North to Okinawa Island (Nakabo, 2000).

Acentrogobius janthinopterus (Bleeker) “Kasumi-haze”

Distribution in Japan: Iriomote Island (present study), north to Okinawa Island (Nakabo, 2000).

Salinity: 30,000 ppm.

Specimens examined: NSMT-P 28513.

Acentrogobius moloanus (Herre) “Futasuji-nobori-haze”

Distribution in Japan: Iriomote Island (present study; Sakai & Sato, 1982), north to Okinawa Island (Nakabo, 2000).

Salinity: 14,000 ppm.

Specimens examined: NSMT-P 28494, 29320.

**Acentrogobius multifasciatus* (Herre) “Seitaka-suji-haze”

Distribution in Japan: Iriomote Island (Hayashi *et al.*, 1981b), north to Okinawa Island (Nakabo, 2000).

Acentrogobius pflaumi (Bleeker) “Suji-haze”

Distribution in Japan: Iriomote, Okinawa, Amami-ohshima and Tanegashima islands (present study), north to Hokkaido (Nakabo, 2000).

Salinity: 120–14,000 ppm.

Specimens examined: NSMT-P 20916, 28428, 28824, 28959, 29195, 29356.

**Acentrogobius suluensis* (Herre) “Hohoguro-suji-haze”

- Distribution in Japan: North to Iriomote Island (Hayashi *et al.*, 1981b).
Acentrogobius viganensis (Steindachner) “Suzume-haze”
 Distribution in Japan: North to Yaeyama Group (present study; Nakabo, 2000).
 Salinity: 396–8,360 ppm.
 Specimens examined: NSMT-P 15850, 28304, 28396, 28444, 28479, 29293, 29318.
- **Acentrogobius viridipunctatus* (Valenciennes) “Kirara-haze”
 Distribution in Japan: North to Okinawa Island (Nakabo, 2000).
 Note: This species is listed as vulnerable (VU) in the Red List by the Japan Environmental Agency (1999).
- **Amblygobius linki* Herre “Wakake-sarasa-haze”
 Distribution in Japan: North to Iriomote Island (Hayashi *et al.*, 1981b).
- **Amblygobius nocturnus* (Herre) “Hohobeni-sarasa-haze”
 Distribution in Japan: North to Yaeyama Group (Hayashi *et al.*, 1981b).
- **Amblygobius phalaena* (Valenciennes) “Sarasa-haze”
 Distribution in Japan: Iriomote Island (Suzuki *et al.*, 1982), north to Wakayama Prefecture (Nakabo, 2000).
- **Asterropteryx ensifera* (Bleeker) “Hime-hoshi-haze”
 Distribution in Japan: Iriomote Island (Suzuki *et al.*, 1982), north to Ryukyu Archipelago (Nakabo, 2000).
- **Asterropteryx semipunctata* Rüpell “Hoshi-haze”
 Distribution in Japan: Iriomote Island (Suzuki *et al.*, 1982), north to Chiba Prefecture (Nakabo, 2000).
- Awaous melanocephalus* (Bleeker) “Kuro-minami-haze”
 Distribution in Japan: Ishigaki, Iriomote, Okinawa, north to Amami-ohshima islands (present study; Nakabo, 2000)
 Salinity: 36.9–215 ppm.
 Specimens examined: NSMT-P 15924, 16007, 28276, 28578, 28645, 28703, 28980, 28988, 29308.
- Awaous ocellaris* (Broussonet) “Minami-haze”
 Distribution in Japan: Ishigaki Island (present study), north to Chiba Prefecture (Nakabo, 2000).
 Salinity: 93.9 ppm.
 Specimens examined: NSMT-P 29364.
- **Bathygobius cocosensis* (Bleeker) “Suji-kumo-haze”
 Distribution in Japan: Yaeyama Group (Suzuki & Senou, 1983), Amami-ohshima Island (Hayashi *et al.*, 1992), Ogasawara Islands, north to Chiba Prefecture (Akihito & Meguro, 1980).
- **Bathygobius cyclopterus* (Valenciennes) “Yahazu-haze”
 Distribution in Japan: Yaeyama Group (Suzuki & Senou, 1983), Amami-ohshima Island (Hayashi *et al.*, 1992), north to Shizuoka Prefecture (Akihito &

Meguro, 1980).

Bathygobius fuscus (Rüpell) “Kumo-haze”

Distribution in Japan: Ishigaki, Iriomote, Okinawa and Amami-ohshima islands (present study), north to Chiba Prefecture (Nakabo, 2000).

Salinity: 1,900–38,700 ppm.

Specimens examined: NSMT-P 15823, 15847, 15968, 20905, 20909, 28451, 28595, 28671, 28771, 28890.

**Bathygobius padangensis* (Bleeker) “Kuro-yahazu-haze”

Distribution in Japan: Yaeyama Group (Suzuki & Senou, 1983), Amami-ohshima Island (Hayashi *et al.*, 1992), north to Chiba Prefecture (Akihito & Meguro, 1980).

**Bathygobius* sp. “Kawa-kumo-haze”

Distribution in Japan: Iriomote Island (Nakabo, 2000).

**Brachyamblyopus anotus* (Franz) “Asagara-haze”

Distribution in Japan: North to Yaeyama Group (Nakabo, 2000).

**Callogobius hasseltii* (Bleeker) “Okinawa-haze”

Distribution in Japan: Iriomote Island (Hayashi *et al.*, 1981b), north to Izu Peninsula (Nakabo, 2000).

Callogobius tanegashimae (Snyder) “Tane-haze”

Distribution in Japan: Ishigaki, Iriomote, Amami-ohshima and Tanegashima islands (present study), north to Mie Prefecture (Nakabo, 2000).

Salinity: 3,270–14,000 ppm.

Specimens examined: NSMT-P 15742, 15957, 28194, 28273, 28286, 28431, 28963, 29216, 29321.

**Callogobius* sp. “Misuji-haze”

Distribution in Japan: Iriomote Island (Nakabo, 2000).

Note: This species was listed as critically endangered (CR) in the Red List by the Japan Environmental Agency (1999).

**Cryptocentroides insignis* (Seale) “Hasu-jima-haze”

Distribution in Japan: North to Miyako Island (Nakabo, 2000).

**Cryptocentrus caeruleomaculatus* (Herre) “Takanoha-haze”

Distribution in Japan: Iriomote Island (Suzuki *et al.*, 1982), north to Hiroshima Prefecture (Nakabo, 2000).

**Cryptocentrus singapurensis* (Herre) “Oiran-haze”

Distribution in Japan: Iriomote Island (Hayashi *et al.*, 1981b), north to Okinawa Island (Nakabo, 2000).

**Cristatogobius nonatoae* (Ablan) “Kuro-tosaka-haze”

Distribution in Japan: North to Yaeyama Group (Akihito & Meguro, 2000).

Note: This species is listed as critically endangered (CR) in the Red List by the Japan Environmental Agency (1999).

**Cristatogobius lophius* Herre “Tosaka-haze”

Distribution in Japan: North to Yaeyama Group (Hayashi *et al.*, 1981b; Akihito & Meguro, 2000).

Note: This species is listed as endangered (EN) in the Red List by the Japan Environmental Agency (1999).

**Cristatogobius aurimaculatus* Akihito et Meguro “Hime-tosaka-haze”

Distribution in Japan: North to Yaeyama Group (Akihito & Meguro, 2000).

Note: This species is listed as rare (R) in the Red Data report by Okinawa Prefecture (1996), and as critically endangered (CR) in the Red List by the Japan Environmental Agency (1999).

Drombus sp. “Kuroko-haze”

Distribution in Japan: Iriomote, Okinawa and Amami-ohshima islands (present study), north to Wakayama Prefecture (Nakabo, 2000).

Salinity: 475–21,900 ppm.

Specimens examined: NSMT-P 28432, 28493, 28541, 28764, 28827, 28962, 29319, 29333.

**Eutaeniichthys gilli* Jordan et Snyder “Himo-haze”

Distribution in Japan: Iriomote Island to Aomori Prefecture (Nakabo, 2000).

**Eviota queenslandica* Whitley “Hoshi-hire-iso-haze”

Distribution in Japan: Iriomote Island (Hayashi *et al.*, 1981b), north to Ryukyu Archipelago (Nakabo, 2000).

Exyrias puntang (Bleeker) “Inko-haze”

Distribution in Japan: Ishigaki, Iriomote and Okinawa islands (present study), north to Amami-ohshima Island (Hayashi *et al.*, 1992).

Salinity: 210–34,300 ppm.

Specimens examined: NSMT-P 15805, 15845, 15877, 15969, 28129, 28190, 28285, 28303, 28352, 28443, 28478, 28491, 28512m 28729, 28761, 28823.

Favonigobius gymnauchen (Bleeker) “Hime-haze”

Distribution in Japan: Ishigaki, Iriomote, Okinawa, Amami-ohshima and Tanegashima islands (present study) to Hokkaido (Nakabo, 2000).

Salinity: 1,390–34,300 ppm.

Specimens examined: NSMT-P 15828, 15911, 28130, 28241, 28445, 28468, 28591, 28762, 28825, 28941, 28960, 29010, 29148, 29213, 55536.

Favonigobius reichei (Bleeker) “Minami-hime-haze”

Distribution in Japan: Ishigaki, Iriomote, Okinawa and Amami-ohshima islands (present study), north to Nansei Islands (Nakabo, 2000).

Salinity: 111–34,300 ppm.

Specimens examined: NSMT-P 15789, 15810, 15871, 20914, 28191, 28255, 28492, 28669, 29323, 55529, 55530, 55531, 55532, 55533, 55534.

Glossogobius aureus Akihito et Meguro “Konjiki-haze”

Distribution in Japan: Iriomote Island (present study), north to Shizuoka Prefecture (Ishida *et al.*, 1998).

Salinity: 133 ppm.

Specimens examined: NSMT-P 18200, 28402.

Note: The NSMT-P 18200 specimen is the holotype of the species (Akihito & Meguro, 1975). This species is listed as critically endangered (CR) in the Red List by the Japan Environmental Agency (1999).

**Glossogobius bicirrhosus* (Weber) “Agohige-haze”

Distribution in Japan: North to Yaeyama Group (Hayashi *et al.*, 1981b; Sakai & Sato, 1982).

Note: This species is listed as critically endangered (CR) in the Red List by the Japan Environmental Agency (1999).

Glossogobius biocellatus (Valenciennes) “Hitomi-haze”

Distribution in Japan: Ishigaki, Okinawa, Amami-ohshima and Tanegashima islands (present study), north to Kochi Prefecture (Nakabo, 2000).

Salinity: 34.3–21,900 ppm.

Specimens examined: NSMT-P 15846, 15910, 15974, 28197, 28205, 28770, 29029, 29159, 29171, 29220, 29350.

Glossogobius celebius (Valenciennes) “Iwa-haze”

Distribution in Japan: Ishigaki, Iriomote, north to Tanegashima islands (present study).

Salinity: 52.2–6,920 ppm.

Specimens examined: NSMT-P 15925, 20907, 29366.

**Glossogobius circumspectus* (Macleay) “Sudare-uro-haze”

Distribution in Japan: North to Ishigaki Island (Nakabo, 2000).

**Glossogobius olivaceus* (Temminck et Schlegel) “Uro-haze”

Distribution in Japan: Tanegashima Island to Niigata and Ibaraki prefectures (Nakabo, 2000).

**Glossogobius* sp. “Futago-haze”

Distribution in Japan: Iriomote Island (Nakabo, 2000).

Gymnogobius castaneus (O’Shaughnessy) “Biringo”

Distribution in Japan: Tanegashima Island (present study) to Japan proper (Nakabo, 2000).

Salinity: 120–6,920 ppm.

Specimens examined: NSMT-P 29198, 29221, 29339.

Gymnogobius sp. 1 “Sumi-ukigori”

Distribution in Japan: Yaku-shima Island (present study) to Hokkaido (Nakabo, 2000).

Salinity: 13.7–15.9 ppm.

Specimens examined: NSMT-P 29077, 29082, 29086, 29091, 29120, 29368.

**Istigobius campbelli* (Jordan et Snyder) “Kutsuwa-haze”

Distribution in Japan: Iriomote Island (Suzuki *et al.*, 1982), north to Toyama and Chiba prefectures (Nakabo, 2000).

**Istigobius ornatus* (Rüpell) “Kazari-haze”

Distribution in Japan: Iriomote Island (Suzuki *et al.*, 1982), north to Nansei Islands (Nakabo, 2000).

Lentipes armatus Sakai et Nakamura “Yoroi-bouzu-haze”

Distribution in Japan: Ishigaki Island (present study) to Amami-ohshima Island (Nakabo, 2000).

Salinity: 62.5 ppm.

Specimens examined: NSMT-P 20775, 28175, 29296, 29315.

Note: NSMT-P 29296 is the holotype of the species, the remaining specimens above being paratypes (Sakai & Nakamura, 1979). The species is listed as critically endangered (CR) in the Red List by the Japan Environmental Agency (1999).

Luciogobius guttatus Gill “Mimizu-haze”

Distribution in Japan: Yaku-shima Island (present study), Iriomote Island to Hokkaido (Nakabo, 2000).

Salinity: 15.9–565 ppm.

Specimens examined: NSMT-P 29062, 29101, 29121, 29369.

Note: The Ryukyu population is listed as a threatened local population (LP) in the Red List by the Japan Environmental Agency (1999).

**Mahidoria mystacina* (Valenciennes) “Kasuri-haze”

Distribution in Japan: Amami-ohshima Island (Hayashi *et al.*, 1992), north to Chiba Prefecture (Nakabo, 2000).

**Mangarinus waterousi* Herre “Uchiwa-haze”

Distribution in Japan: North to Okinawa Island (Akihito & Meguro, 1977).

**Mugilogobius abei* (Jordan et Snyder) “Abe-haze”

Distribution in Japan: Tanegashima Island to Miyagi and Ishikawa prefectures (Nakabo, 2000).

Mugilogobius chulae (Smith) “Nami-haze”

Distribution in Japan: Ishigaki, Iriomote, north to Amami-ohshima islands (present study; Nakabo, 2000).

Salinity: 79.1–34,300 ppm.

Specimens examined: NSMT-P 15745, 15761, 15788, 15807, 15825, 15976, 28135, 28259, 28296, 28309, 28340, 28362, 28384, 28400, 28450, 28498, 28965, 29325.

**Mugilogobius fusca* (Herre) “Futahoshi-haze”

Distribution in Japan: North to Iriomote Island (Nakabo, 2000).

Mugilogobius parvus (Ohshima) “Hohoguro-haze”

Distribution in Japan: North to Yaeyama Group (present study; Nakabo, 2000).

Salinity: 24,400 ppm.

Specimens examined: NSMT-P 28401, 28426, 29365.

Note: Sakai & Sato (1982) misidentified these specimens as *M. cavifrons*.

Mugilogobius sp. 1 “Izumi-haze”

Distribution in Japan: Ishigaki, Amami-ohshima and Tanegashima islands (present study) to Kami-koshiki Island (Hayashi, 1976).

Salinity: 37.2–12,800 ppm.

Specimens examined: NSMT-P 15744, 15975, 28857, 28936, 28964, 28989, 29197, 29218.

Mugilogobius sp. 2 “Tanuki-haze”

Distribution in Japan: Yaeyama Group (present study; Nakabo, 2000).

Salinity: 79.1–7,950 ppm.

Specimens examined: NSMT-P 15826, 28295, 29326.

**Mugilogobius* sp. 3 “Mujina-haze”

Distribution in Japan: Iriomote Island (Nakabo, 2000).

**Myersina macrostoma* Herre “Hagoromo-haze”

Distribution in Japan: Yaeyama Group (Akihito & Meguro, 1978; Suzuki *et al.*, 1982), north to Okinawa Island (Nakabo, 2000).

Oligolepis acutipennis (Valenciennes) “Nobori-haze”

Distribution in Japan: Ishigaki, Iriomote, Okinawa and Tanegashima islands (present study), north to Chiba Prefecture (Nakabo, 2000).

Salinity: 133–24,400 ppm.

Specimens examined: NSMT-P 15972, 28305, 28381, 28397, 28423, 28447, 28765, 29214.

Oligolepis stomias (Smith) “Kuchisake-haze”

Distribution in Japan: Ishigaki, Okinawa, north to Tanegashima islands (present study; Nakabo, 2000).

Salinity: 1,090–21,900 ppm.

Specimens examined: NSMT-P 28193, 28593, 28766, 28841, 29169, 29215, 29363.

**Oxyurichthys ophthalmonema* (Bleeker) “Matsuge-haze”

Distribution in Japan: North to Kanagawa Prefecture (Suzuki *et al.*, 2000).

Oxyurichthys visayanus Herre “Minami-saru-haze”

Distribution in Japan: Okinawa Island (present study), north to Ryukyu Archipelago (Nakabo, 2000).

Salinity: 21,900 ppm.

Specimens examined: NSMT-P 28760, 29354.

Oxyurichthys sp. 1 “Kamahire-matsuge-haze”

Distribution in Japan: Okinawa Island (present study) to Yaeyama Group (Suzuki *et al.*, 2000).

Salinity: 8,960 ppm.

Specimens examined: NSMT-P 28822, 29334.

**Oxyurichthys* sp. 3 “Shima-saru-haze”

Distribution in Japan: Iriomote Island (Suzuki *et al.*, 2000).

Pandaka lidwilli (McCulloch) “Goma-haze”

Distribution in Japan: Ohsumi Group (present study), north to Wakayama Prefecture (Nakabo, 2000).

Salinity: 1,410–35,200 ppm.

Specimens examined: NSMT-P 29263, 29477.

Pandaka trimaculata Akihito et Meguro “Mitsuboshi-goma-haze”

Distribution in Japan: Ishigaki, Iriomote and Okinawa islands (present study), north to Amami-ohshima Island (Nakabo, 2000).

Salinity: 52.2–34,300 ppm.

Specimens examined: NSMT-P 15747, 15955, 28134, 28258, 28308, 28339, 28496, 28543, 28769, 29324.

Periophthalmus argentilineatus Valenciennes “Minami-tobi-haze”

Distribution in Japan: Ishigaki, Iriomote, Okinawa, north to Amami-ohshima islands (present study; Nakabo, 2000).

Salinity: 79.1–30,200 ppm.

Specimens examined: NSMT-P 15748, 15811, 15829, 15980, 20904, 28196, 28277, 28289, 28298, 28310, 28341, 28355, 28433, 28449, 28481, 28499, 28596, 28772, 28805, 28829, 28938, 28967, 29309.

Periophthalmus modestus Cantor “Tobi-haze”

Distribution in Japan: Okinawa and Tanegashima islands (present study) to Tokyo Bay (Nakabo, 2000).

Salinity: 120–12,100 ppm.

Specimens examined: NSMT-P 28625, 28843, 29160, 29199, 29223, 29351, 29352.

Note: The Okinawa population is listed as rare (R) in the Red Data report by Okinawa Prefecture (1996) and in the Data Book by the Japan Fisheries Agency (1998), and as a threatened local population (LP) in the Red List by the Japan Environmental Agency (1999).

Priolepis semidoliata (Valenciennes) “Irezumi-haze”

Distribution in Japan: Iriomote Island (present study), north to Nansei Islands (Nakabo, 2000).

Salinity: 32,700 ppm.

Specimens examined: NSMT-P 29294.

Pseudogobius javanicus (Bleeker) “Sunago-haze”

Distribution in Japan: Ishigaki, Iriomote and Okinawa islands (present study), north to Nansei Islands (Nakabo, 2000).

Salinity: 79.1–34,300 ppm.

Specimens examined: NSMT-P 15743, 15790, 15808, 15824, 15848, 15978, 28133, 28257, 28275, 28288, 28297, 28307, 28338, 28354, 28383, 28399, 28425, 28448, 28480, 28497, 28623, 28670, 28768.

Pseudogobius masago (Tomiya) “Masago-haze”

Distribution in Japan: Tanegashima Island (present study), Okinawa Island to Miyagi Prefecture (Kawanabe & Mizuno, 1989).

Salinity: 6,920 ppm.

Specimens examined: NSMT-P 29212, 29355.

Note: The Okinawa population is listed as a threatened local population (LP) in the Red List by the Japan Environmental Agency (1999).

**Pseudogobius* sp. “Kokuchi-sunago-haze”

Distribution in Japan: Iriomote Island (Nakabo, 2000).

**Redigobius balteatus* (Herre) “Tasuki-hina-haze”

Distribution in Japan: North to Iriomote Island (Senou & Yano, 1991).

Note: This species is listed as critically endangered (CR) in the Red List by the Japan Environmental Agency (1999).

Redigobius bikolanus (Herre) “Hina-haze”

Distribution in Japan: Ishigaki, Iriomote, Okinawa, Amami-ohshima, Tanegashima and Yaku-shima islands (present study), north to Kanagawa Prefecture (Nakabo, 2000).

Salinity: 15.9–38,700 ppm.

Specimens examined: NSMT-P 15746, 15763, 15791, 15809, 15827, 15849, 15926, 15935, 15938, 15943, 15970, 20772, 28132, 28152, 28195, 28204, 28212, 28243, 28245, 28256, 28265, 28270, 28274, 28287, 28306, 28337, 28361, 28382, 28398, 28424, 28495, 28542, 28555, 28594, 28609, 28618, 28686, 28702, 28731, 28767, 28798, 28856, 28889, 28906, 28920, 28932, 28979, 28993, 29070, 29095, 29100, 29108, 29127, 29170, 29176, 29188, 29217, 29231.

Rhinogobius giurinus (Rutter) “Gokuraku-haze”

Distribution in Japan: Ishigaki, Iriomote, Okinawa, Amami-ohshima, Tanegashima and Yaku-shima islands (present study) to Akita and Ibaraki prefectures (Nakabo, 2000).

Salinity: 13.7–38,700 ppm.

Specimens examined: NSMT-P 15822, 15843, 15870, 15900, 15912, 15931, 15934, 15944, 15971, 20912, 28151, 28203, 28211, 28242, 28544, 28554, 28566, 28577, 28592, 28634, 28644, 28678, 28685, 28711, 28730, 28804, 28828, 28855, 28859, 28866, 28872, 28888, 28900, 28919, 28992, 29002, 29012, 29040, 29047, 29055, 29061, 29069, 29076, 29081, 29085, 29090, 29094, 29099, 29107, 29119, 29126, 29132, 29136, 29149, 29158, 29168, 29175, 29181, 29187, 29196, 29219, 29230, 29240, 29246, 29255, 29268.

Rhinogobius sp. BB “Aobara-yoshinobori”

Distribution in Japan: Okinawa Island (present study).

Salinity: 49.1–55.8 ppm.

Specimens examined: NSMT-P 28532, 28628, 29307.

Note: Endemic to the northern part of the Okinawa Island (Kawanabe &

Mizuno, 1989; Nakabo, 2000). This species is listed as vulnerable (VU) in the Red Data report by Okinawa Prefecture (1996) and in the Data Book by the Japan Fisheries Agency (1998), and as endangered (EN) in the Red List by the Japan Environmental Agency (1999).

Rhinogobius sp. CB “Shima-yoshinobori”

Distribution in Japan: Ishigaki, Iriomote, Okinawa, Amami-ohshima, Tanegashima and Yaku-shima islands (present study) to Aomori Prefecture (Nakabo, 2000).

Salinity: 15.9–287 ppm.

Specimens examined: NSMT-P 15851, 28210, 28217, 28221, 28264, 28269, 28524, 28553, 28565, 28602, 28607, 28626, 28632, 28642, 28651, 28658, 28684, 28693, 28701, 28708, 28719, 28845, 28862, 28870, 28877, 28881, 28899, 28904, 28917, 28924, 28976, 28991, 29000, 29031, 29088, 29229, 29238, 29252, 29266, 29357, 29358.

Rhinogobius sp. DA “Kuro-yoshinobori”

Distribution in Japan: Ishigaki, Okinawa, Amami-ohshima, Tanegashima and Yaku-shima islands (present study) to Niigata and Chiba Prefectures (Nakabo, 2000).

Salinity: 13.7–174 ppm.

Specimens examined: NSMT-P 15891, 15892, 28166, 28170, 28531, 28569, 28603, 28627, 28649, 28652, 28692, 28694, 28709, 28720, 28784, 28925, 29032, 29053, 29059, 29067, 29079, 29084, 29089, 29106, 29117, 29130, 29134, 29138, 29239, 29247, 29249, 29253, 29267, 29306.

Rhinogobius sp. DL “Hira-yoshinobori”

Distribution in Japan: Ishigaki, Iriomote, Amami-ohshima, Tanegashima and Yaku-shima islands (present study).

Salinity: 13.7–100 ppm.

Specimens examined: NSMT-P 20925, 28171, 28517, 28519, 28882, 28931, 29054, 29060, 29068, 29075, 29080, 29131, 29135, 29359, 29360.

Note: Endemic to the Ryukyu Archipelago (Kawanabe & Mizuno, 1989; Nakabo, 2000).

Rhinogobius sp. MO “Aya-yoshinobori”

Distribution in Japan: Okinawa and Amami-ohshima islands (present study).

Salinity: 34.3–55.8 ppm.

Specimens examined: NSMT-P 28604, 28608, 28633, 28643, 28695, 28710, 28721, 28785, 28871, 28878, 28883, 28905, 28918, 28926, 28977, 29001, 29303, 29361, 29362.

Note: Endemic to the Okinawa and Amami-ohshima islands (Kawanabe & Mizuno, 1989; Nakabo, 2000).

Rhinogobius sp. YB “Kibara-yoshinobori”

Distribution in Japan: Yaeyama Group (present study), Okinawa to Amami-

ohshima islands (Japan Fisheries Agency, 1998).

Salinity: 39.7–62.5 ppm.

Specimens examined: NSMT-P 28222, 28518, 28520.

Note: Endemic to these islands (Kawanabe & Mizuno, 1989; Nakabo, 2000).

This species is listed as vulnerable (VU) in the Red Data report by Okinawa Prefecture (1996) and in the Data Book by the Japan Fisheries Agency (1998), and as endangered (EN) in the Red List by the Japan Environmental Agency (1999).

Schismatogobius roxasi Herre “Eso-haze”

Distribution in Japan: North to Yaeyama Group (present study; Nakabo, 2000).

Salinity: 93.9 ppm.

Specimens examined: NSMT-P 29292.

Note: This species is listed as endangered (EN) in the Red List by the Japan Environmental Agency (1999).

**Schismatogobius ampluvinculus* Chen, Shao et Fang “Shima-eso-haze”

Distribution in Japan: North to Yaeyama Group (Suzuki & Senou, 1981).

Note: This species is listed as endangered (EN) in the Red List by the Japan Environmental Agency (1999).

Sicyopterus japonicus (Tanaka) “Bouzu-haze”

Distribution in Japan: Ishigaki, Okinawa, Amami-ohshima, Tanegashima and Yaku-shima islands (present study) to Tochigi Prefecture (Nakabo, 2000).

Salinity: 13.7–287 ppm.

Specimens examined: NSMT-P 20906, 20915, 28223, 28533, 28556, 28567, 28605, 28610, 28629, 28635, 28646, 28650, 28653, 28659, 28704, 28712, 28722, 28846, 28873, 28879, 28907, 28921, 28927, 28939, 28981, 28994, 29003, 29013, 29034, 29057, 29063, 29071, 29078, 29083, 29109, 29122, 29133, 29137, 29139, 29177, 29232, 29241, 29248, 29256, 29269, 29310, 29353.

Sicyopterus lagocephalus (Bleeker) “Ruri-bouzu-haze”

Distribution in Japan: Ishigaki, Okinawa, north to Amami-ohshima islands (present study; Nakabo, 2000).

Salinity: 36.9–62.5 ppm.

Specimens examined: NSMT-P 20780, 28167, 28172, 28224, 28647, 28908, 29295.

Note: This species is listed as endangered (EN) in the Red List by the Japan Environmental Agency (1999).

Sicyopus leprurus Sakai et Nakamura “Kaeru-haze”

Distribution in Japan: North to Yaeyama Group (present study; Nakabo, 2000).

Salinity: 62.5 ppm.

Specimens examined: NSMT-P 15979, 20774, 28169, 28174.

Note: NSMT-P 15979 is the holotype of the species, the remaining specimens

above being paratypes (Sakai & Nakamura, 1979). The species is listed as critically endangered (CR) in the Red List by the Japan Environmental Agency (1999).

Sicyopus zosterophorus (Bleeker) “Aka-bouzu-haze”

Distribution in Japan: Ishigaki and Okinawa islands (present study), north to Ryukyu Archipelago (Nakabo, 2000).

Salinity: 62.5 ppm.

Specimens examined: NSMT-P 20781, 20782, 20783, 29314.

Note: This species is listed as critically endangered (CR) in the Red List by the Japan Environmental Agency (1999).

**Silhouettea* sp. “Nise-shiranui-haze”

Distribution in Japan: Yaeyama Group (Nakabo, 2000).

Stenogobius ophthalmoporus (Bleeker) “Douke-haze”

Distribution in Japan: Ishigaki Island (present study; Sakai & Sato, 1982), north to Okinawa Island (Mr. K. Nakajima and Dr. A. Iwata, pers. com.).

Salinity: 52.2 ppm.

Specimens examined: NSMT-P 16008.

Stenogobius sp. “Tanekawa-haze”

Distribution in Japan: izshigaki, Iriomote and Okinawa islands (present study), north to Nansei islands (Nakabo, 2000).

Salinity: 41.0–210 ppm.

Specimens examined: NSMT-P 15762, 15923, 15932, 15973, 28233, 28380, 28422, 28783, 28797, 29281.

Note: Watson (1991) did not evaluate the status of Japanese specimens because of the as-then-unresolved taxonomy of the recognized *S. (Insularigobius) blokzeyli* species’ complex. The recognized distribution range of “Tanekawa-haze” should be extended further south.

**Stiphodon atropurpureus* (Herre) “Kon-teri-bouzu-haze”

Distribution in Japan: North to Yaeyama Group (Watson & Chen, 1998; Nakabo, 2000).

**Stiphodon imperiorientis* Watson et Chen “Hayase-bouzu-haze”

Distribution in Japan: Iriomote Island (Watson & Chen, 1998) to Okinawa Island (Nakabo, 2000).

Note: Formerly reported as *S. stevensoni* by Nakabo (1993) (Watson & Chen, 1998). This species is listed as critically endangered (CR) in the Red List by the Japan Environmental Agency (1999).

Stiphodon percnopterygionus Watson et Chen “Nanyou-bouzu-haze”

Distribution in Japan: Ishigaki, Okinawa, Amami-ohshima and Yaku-shima islands (present study), north to Kochi Prefecture (Shibuya & Takahashi, 1998).

Salinity: 15.9–287 ppm.

Specimens examined: NSMT-P 15933, 15950, 15977, 20779, 28168, 28173,

28225, 28557, 28568, 28636, 28648, 28713, 28922, 29072, 29327, 29341.

Note: Formerly reported as *S. elegans* by Nakabo (1993) (Watson & Chen, 1998).

**Taenioides cirratus* (Blyth) “Chi-warasubo”

Distribution in Japan: Amami-ohshima Island (Hayashi *et al.*, 1992), north to Shizuoka Prefecture (Nakabo, 2000).

Taenioides limicola Smith “Hige-warasubo”

Distribution in Japan: Ishigaki Island (present study), north to Okinawa Island (Nakabo, 2000).

Salinity: 9,520 ppm.

Specimens examined: NSMT-P 29370.

Tridentiger kuroiwae Jordan et Tanaka “Nagano-gori”

Distribution in Japan: Yaku-shima, Tanegashima, Amami-ohshima, Okinawa and Iriomote islands (present study).

Salinity: 15.9–6,920 ppm.

Specimens examined: NSMT-P 20918, 20919, 28268, 28312, 28523, 28552, 28564, 28631, 28641, 28657, 28707, 28728, 28854, 28869, 28876, 28880, 28887, 28898, 28903, 28916, 28923, 28930, 28975, 29052, 29065, 29093, 29098, 29105, 29116, 29125, 29167, 29174, 29211, 29228, 29237, 29265, 29305.

Note: Endemic to the Ryukyu Archipelago (Kawanabe & Mizuno, 1989; Nakabo, 2000).

Yongeichthys criniger (Valenciennes) “Tsumugi-haze”

Distribution in Japan: Ishigaki, Iriomote, Okinawa, north to Amami-ohshima islands (present study; Nakabo, 2000).

Salinity: 210–34,300 ppm.

Specimens examined: NSMT-P 15741, 15787, 15806, 15844, 15857, 15888, 16009, 28131, 28150, 28192, 28353, 28430, 28446, 28467, 28741, 28763, 28826, 28961, 29028.

Kraemeriidae

**Gobitrichinotus radiocularis* Fowler “Naminoko-haze”

Distribution in Japan: North to Yaeyama Group (Nakabo, 2000).

**Kraemeria cunicularia* Rofen “Suna-haze”

Distribution in Japan: North to Yaeyama Group (Hayashi *et al.*, 1981b).

**Kraemeria tongaensis* Rofen “Tonga-suna-haze”

Distribution in Japan: North to Ryukyu Archipelago (Hayashi *et al.*, 1981b).

Microdesmidae

**Parioglossus dotsui* Tomiyama “Satsuki-haze”

Distribution in Japan: Yaeyama Group to Ishikawa and Chiba prefectures (Nakabo, 2000).

**Parioglossus lineatus* Rennis et Hoese “Maiko-haze”

Distribution in Japan: North to Iriomote Island (Suzuki *et al.*, 1994).

Note: This species is listed as critically endangered (CR) in the Red List by the Japan Environmental Agency (1999).

**Parioglossus palustris* (Herre) “Boruneo-haze”

Distribution in Japan: North to Iriomote Island (Nakabo, 2000).

**Parioglossus philippinus* (Herre) “Benitsuke-satsuki-haze”

Distribution in Japan: Iriomote Island (Suzuki & Senou, 1992), north to Kanagawa Prefecture (Nakabo, 2000).

**Parioglossus rainfordi* McCulloch “Kobito-haze”

Distribution in Japan: North to Iriomote Island (Nakabo, 2000).

**Parioglossus raoi* (Herre) “Miyarabi-haze”

Distribution in Japan: North to Okinawa Island (Nakabo, 2000).

**Parioglossus taeniatus* Regan “Komachi-haze”

Distribution in Japan: North to Iriomote Island (Suzuki *et al.*, 1994).

Note: This species is listed as critically endangered (CR) in the Red List by the Japan Environmental Agency (1999).

**Parioglossus interruptus* Suzuki et Senou “Hime-satsuki-haze”

Distribution in Japan: North to Iriomote Island (Suzuki & Senou, 1994).

Siganidae

Siganus guttatus (Bloch) “Goma-aigo”

Distribution in Japan: Ishigaki, Iriomote and Okinawa islands (present study), north to Ryukyu Archipelago (Nakabo, 2000).

Salinity: 210–34,300 ppm.

Specimens examined: NSMT-P 15814, 15872, 15890, 15916, 16011, 28137, 28153, 28164, 28328, 28356, 28774, 28832.

Siganus spinus (Linnaeus) “Ami-aigo”

Distribution in Japan: Okinawa Island (present study), north to Suruga Bay (Nakabo, 2000).

Salinity: 1,900–30,200 ppm.

Specimens examined: NSMT-P 28597, 28672, 28806, 28831, 29335.

**Siganus vermiculatus* (Valenciennes) “Mushikui-aigo”

Distribution in Japan: North to Okinawa Island (Nakabo, 2000).

**Siganus virgatus* (Valenciennes) “Hime-aigo”

Distribution in Japan: Ishigaki Island (Hayashi *et al.*, 1981a), north to Kii Peninsula (Nakabo, 2000).

Siganus fuscescens (Houttuyn) “Aigo”

Distribution in Japan: Iriomote Island (present study), north to Aomori Prefecture (Nakabo, 2000).

Salinity: No data.

Specimens examined: NSMT-P 28327.

Acanthuridae

**Acanthurus triostegus* (Linnaeus) “Shima-hagi”

Distribution in Japan: Ishigaki Island (Hayashi *et al.*, 1981a), north to southern Japan (Nakabo, 2000).

Acanthurus xanthopterus Valenciennes “Kuro-hagi”

Distribution in Japan: Ishigaki, Iriomote and Okinawa islands (present study), north to southern Japan (Nakabo, 2000).

Salinity: 862–34,300 ppm.

Specimens examined: NSMT-P 15889, 16010, 28136, 28163, 28199, 28469, 28514, 28773, 28830.

Sphyraenidae

Sphyraena barracuda (Walbaum) “Oni-kamasu”

Distribution in Japan: Ishigaki, Iriomote, Okinawa and Amami-ohshima islands (present study), north to southern Japan (Nakabo, 2000).

Salinity: 210–21,900 ppm.

Specimens examined: NSMT-P 28148, 28162, 28188, 28756, 28821, 28957, 29289, 15954.

Belontiidae

Macropodus opercularis (Linnaeus) “Taiwan-kingyo”

Distribution in Japan: Okinawa Island (present study), Yaeyama Group, Tokashiki, Okierabu and Amami-ohshima islands (Kochi, 1991).

Salinity: 41.0–1,650 ppm.

Specimens examined: NSMT-P 28691, 28714, 28723, 28732, 28786, 28799.

Note: Introduced (Nakabo, 2000). This species is listed as vulnerable (VU) in the Red Data report by Okinawa Prefecture (1996), and as critically endangered (CR) in the Red List by the Japan Environmental Agency (1999).

Channidae

**Channa asiatica* (Linnaeus) “Koutai”

Distribution in Japan: Yaeyama Group (Kochi, 1991).

Note: Introduced from Taiwan in the 1960s (Kochi, 1991).

**Channa maculata* (Lacepède) “Taiwan-dojo”

Distribution in Japan: Yaeyama Group (Kochi, 1991).

Note: Introduced from Taiwan in the 1960s (Kochi, 1991).

Paralichthyidae

Pseudorhombus arsius (Hamilton) “Tenjiku-garei”

Distribution in Japan: Okinawa Island (present study), north to Aichi Prefecture (Nakabo, 2000).

Salinity: 475–8,960 ppm.

Specimens examined: NSMT-P 28733, 28833, 29284.

**Bothus mancus* (Broussonet) “Mon-daruma-garei”

Distribution in Japan: Ishigaki Island (Hayashi *et al.*, 1981a), north to Wakayama Prefecture (Nakabo, 2000).

Bothus pantherinus (Rüpell) “Toge-daruma-garei”

Distribution in Japan: Yaeyama Group (present study), north to Wakayama Prefecture (Nakabo, 2000).

Salinity: 9,520–32,700 ppm.

Specimens examined: NSMT-P 16012, 28200, 28452, 28470.

Soleidae

**Paradachirus pavoninus* (Lacepède) “Minami-ushinoshita”

Distribution in Japan: Yaeyama Group (Senou & Suzuki, 1980a), north to Atsumi Bay (Nakabo, 2000).

**Synaptura marginata* Boulenger “Amami-ushinoshita”

Distribution in Japan: Yaeyama Group (Senou & Suzuki, 1980a), north to Amami-ohshima Island (Nakabo, 2000).

Balistidae

**Pseudobalistes flavimarginatus* (Rüpell) “Kiheri-mongara”

Distribution in Japan: Ishigaki Island (Hayashi *et al.*, 1981a), north to Sagami Bay (Nakabo, 2000).

Tetraodontidae

Arothron hispidus (Linnaeus) “Sazanami-fugu”

Distribution in Japan: Ishigaki and Okinawa islands (present study), north to Chiba Prefecture (Nakabo, 2000).

Salinity: 8,960–34,300 ppm.

Specimens examined: NSMT-P 28183, 28834, 29297.

Arothron manilensis (Procé) “Suji-moyou-fugu”

Distribution in Japan: Yaeyama Group (present study), north to Ryukyu Archi-

pelago (Nakabo, 2000).

Salinity: 977–34,300 ppm.

Specimens examined: NSMT-P 15873, 15913, 16014, 20773, 28139, 28155, 28482, 28500, 28516.

**Arothron reticularis* (Bloch et Schneider) “Wamon-fugu”

Distribution in Japan: Ryukyu Archipelago (Kawanabe & Mizuno, 1989), north to Chiba Prefecture (Nakabo, 2000).

Arothron stellatus (Bloch et Schneider) “Moyou-fugu”

Distribution in Japan: Okinawa Island (present study), north to Ibaraki Prefecture (Nakabo, 2000).

Salinity: 18,800 ppm.

Specimens examined: NSMT-P 29382.

Chelonodon patoca (Hamilton) “Okinawa-fugu”

Distribution in Japan: Ishigaki, Iriomote, Okinawa and Amami-ohshima islands (present study), north to Kii Peninsula (Nakabo, 2000).

Salinity: 862–38,700 ppm.

Specimens examined: NSMT-P 16013, 20908, 20911, 20926, 28154, 28165, 28290, 28357, 28458, 28471, 28515, 28598, 28734, 28742, 28776, 28807, 28836, 28844, 28891, 28968.

Takifugu niphobles (Jordan et Snyder) “Kusa-fugu”

Distribution in Japan: Okinawa, Amami-ohshima, Tanegashima and Yaku-shima islands (present study) to Aomori Prefecture (Nakabo, 2000).

Salinity: 15.9–21,900 ppm.

Specimens examined: NSMT-P 28775, 28835, 28940, 28969, 29073, 29123, 29200, 29224, 29225, 29233, 29273.

Diodontidae

**Diodon holocanthus* Linnaeus “Hari-senbon”

Distribution in Japan: Amami-ohshima Island (Hayashi *et al.*, 1992), north to Aomori Prefecture (Nakabo, 2000).

Discussion

As listed above, 308 species and 8 subspecies (310 species/subspecies), representing 70 families, have been recorded from the rivers of the Ryukyu Archipelago, 157 species and 7 subspecies (48 families) having been collected as part of the present study. According to Kochi (1991), 14 species and 2 subspecies (*Carassius auratus* subsp. 1, *C. cuvieri*, *Pseudorasbora parva*, *Clarias fuscus*, *Gambusia affinis affinis*, *Poecilia reticulata*, *Xiphophorus helleri*, *X. variatus*, *Lepomis macrochirus*, *Micropterus salmoides*, *Oreochromis mossambicus*, *O. niloticus*, *Channa asiatica* and

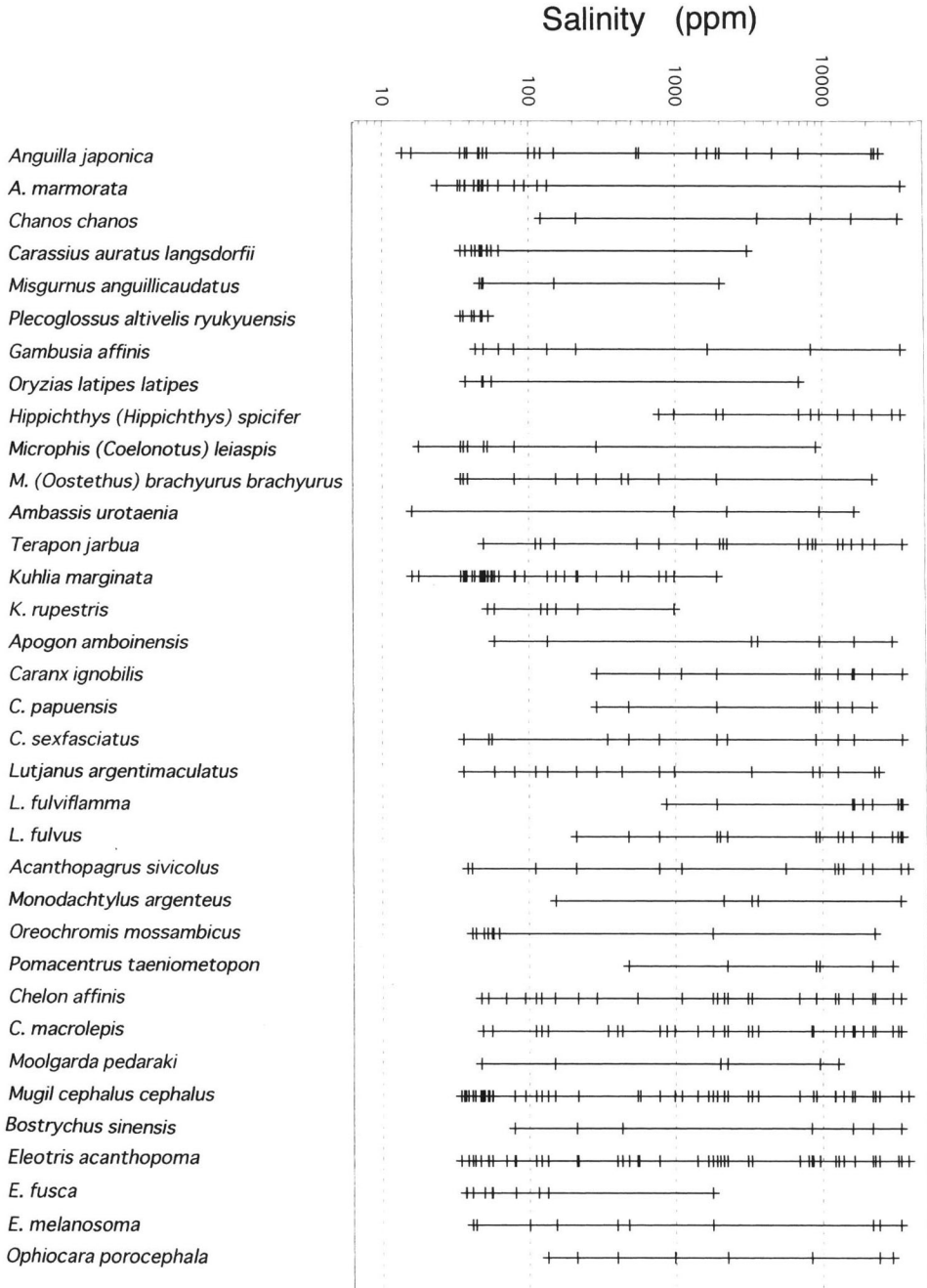
C. maculata) have undoubtedly been introduced, and 3 species (*Cyprinus carpio*, *Monopterus albus* and *Macropodus opercularis*) possibly so. *Liposarcus disjunctius* was also recorded as an introduced species (Nakabo, 2000). Kochi (1991) tentatively concluded that two primary freshwater fishes, *Carassius auratus langsdorffii* and *Misgurnus anguillicaudatus*, were naturally distributed. Therefore, 291 species and 6 subspecies (292 species/subspecies) can be considered as native to the Ryukyu Archipelago.

Randall (1998) concluded that at least 2,000 inshore and brackish water fish species could be expected to be recorded from the Ryukyu Archipelago. Adding the approximately 40 purely freshwater fishes from the above list (including catadromous and amphidromous species; discussed below) to his count, about 14 % of the Ryukyu Archipelago's fishes dwell in, utilize as habitat, or enter rivers.

Gobiid species are the most abundant in the rivers (102 species; about 35% of the total), by far exceeding the second most abundant family, Mugilidae (13 species/subspecies; about 4% of the total). Gobiidae is also the best-represented family in inshore waters of the Ryukyu Archipelago (about 290 species/subspecies; Nakabo, 2000). River-entering species therefore account for about 35% of overall gobiid species. On the other hand, only a small fraction of the next most prolific inshore species, such as Labridae (about 120 species), Serranidae (90 species), Pomacentridae (85 species), Apogonidae (75 species), Blenniidae (60 species), or Chaetodontidae (50 species) (numbers being approximate counts from Nakabo, 2000), utilizes rivers as habitat.

Figure 2 shows the salinity range for 69 species/subspecies collected from more than four locations, such species representing common river fishes in the Ryukyu Archipelago. Other fishes are either rare, or only occasionally or accidentally enter rivers. Several patterns, related to the salinity data, were apparent. Considering freshwater (not exceeding about 100 ppm), brackish water (from about 100 ppm to about 10,000 ppm) and sea water (greater than about 10,000 ppm) habitats (tentative classification), 8 species occurred only in freshwater, 3 in brackish water, 20 in fresh- to brackish water, 18 in brackish to sea water, and 20 species in water that ranged widely from fresh- to sea water (Fig. 3). Vertically, freshwater, brackish water and sea water zones of rivers accommodated 48, 61 and 38 species/subspecies, respectively. These figures indicate that fish species' diversity is generally greatest in the brackish water zone of the Ryukyu Archipelago's rivers.

Only about 40 species/subspecies of the native fishes listed above were considered to be purely freshwater fishes (main habitat freshwater zone). Moreover, only five are classified as primary freshwater fishes *sensu* Darlington (1957), namely, *Carassius auratus langsdorffii*, *Misgurnus anguillicaudatus*, *Oryzias latipes latipes*, *Rhinogobius* sp. BB and *R.* sp. YB (larvae of the latter two species, characterized by spawning larger eggs than Ryukyu Archipelago's congeners, do not migrate to the sea (Kawanabe & Mizuno, 1989)). The remaining species are all diadromous fishes *sensu*



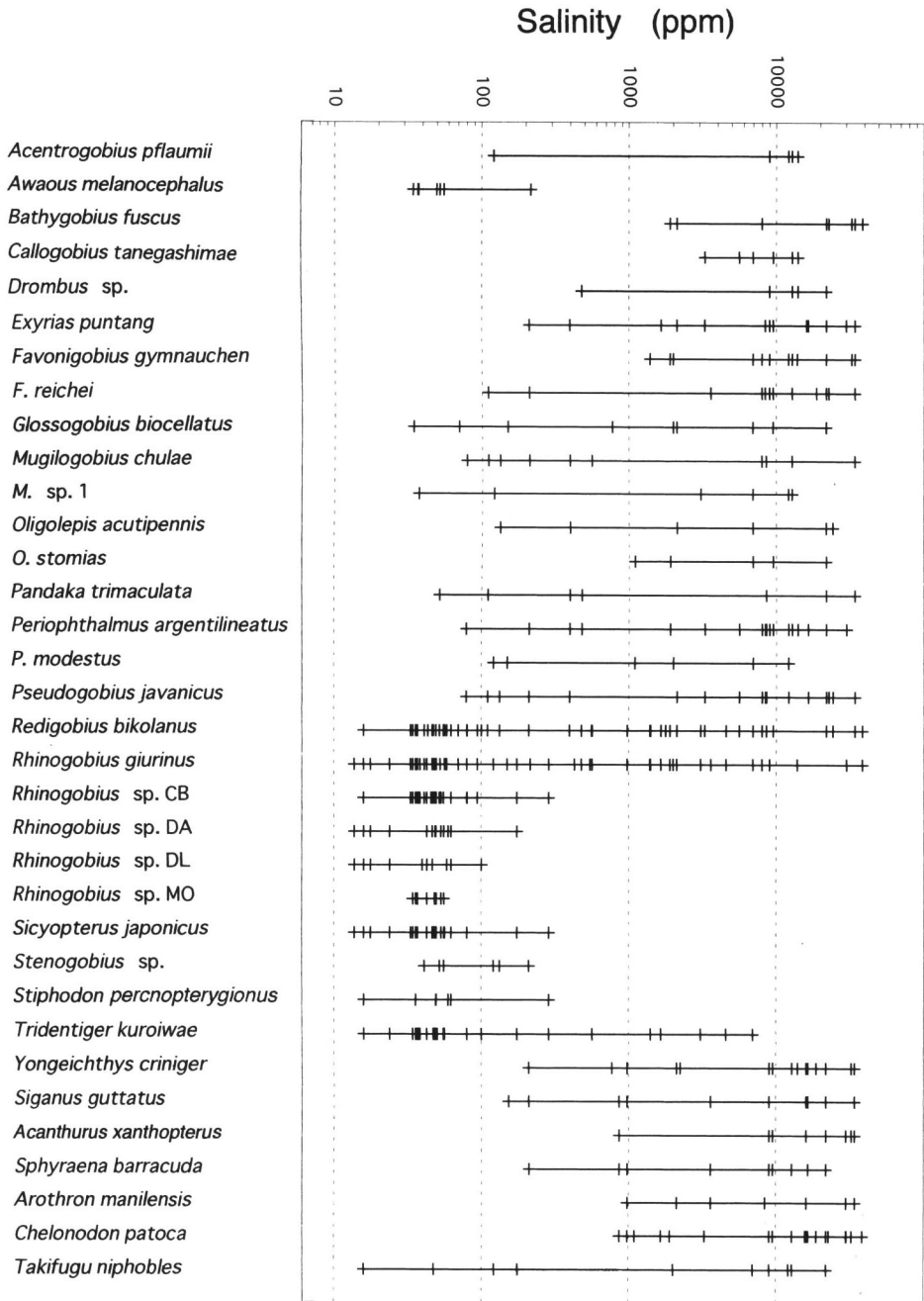


Fig. 2. Salinity ranges (ppm) of locations from which each species was collected (only species collected from more than four locations included).

Number of Species	Freshwater	Brackish water	Sea water
8	[Bar extending from Freshwater to Brackish water]		
20	[Bar extending from Freshwater to Sea water]		
18	[Bar extending from Brackish water to Sea water]		
20	[Bar extending from Freshwater to Sea water]		
3	[Bar extending from Brackish water to Sea water]		

Fig. 3. Summary of Fig. 2, according to water type (freshwater, brackish water and sea water).

Myers (1949), illustrating the outstanding characteristic of the freshwater fish fauna of an oceanic island or island group (Herre, 1941; Darlington, 1957).

Table 2 includes the distribution of each species collected during the study, from south of the Ryukyu Archipelago to Japan proper. These can be grouped according to the following three categories, namely, species from the south (southern species), species from the north (northern species) and endemic species (Fig. 4). Only 18 transplanted species/subspecies and 12 species as yet undescribed and of uncertain distribution (viz. *Mesopristes* sp., *Gerres* sp., *Bathygobius* sp., *Callogobius* sp., *Drombus* sp., *Glossogobius* sp., *Mugilogobius* sp. 1, *M. sp. 2.*, *M. sp. 3.*, *Oxyurichthys* sp. 3, *Pseudogobius* sp. and *Silhouettea* sp.) have been excluded from Figure 4.

The greatest number of species (240 species/subspecies) are included in the “southern” category (Fig. 4), the number decreasing gradually from the southern to the northern islands. However, no drastic faunal change exists, such as between the Okinawa and Amami islands as suggested by Aoyagi (1957). All the species/subspecies are diadromous, with eggs and/or larvae that can be conveyed by the Kuroshio Current that flows along the Ryukyu Archipelago from south to north, juveniles subsequently ascending rivers thus reached. Therefore, the northern limit of distribution may vary according to the spawning place and planktonic life span of each species. Notwithstanding, the distribution pattern of *Hippichthys (Parasyngnathus) penicillus* is singularly unusual, the species occurring in the eastern Indo-western Pacific region and from Tanegashima Island to the Kii Peninsula, but being absent from the Yaeyama to Amami islands (Nakabo, 2000); the reason for this is unknown.

Twenty-nine species/subspecies are categorized as “northern” species (Fig. 4). Of these, *Plecoglossus altivelis altivelis*, *Platycephalus* sp. 2, *Lates japonicus*, *Lateolabrax latus*, *Acanthopagrus schlegeli*, *Acanthogobius flavimanus*, *Gymnogobius castaneus*, *G. sp. 1*, *Glossogobius olivaceus* and *Mugilogobius abei* occur from Japan

Table 2. Distribution of 148 species/subspecies collected in the present study. C: our collection. L: literature. T/C: recorded from Taiwan and/or China.

Scientific name	South of Yaeyama G	Yaeyama Group	Okinawa Island	Amami- ohshima Island	Oosumi Group	Japan proper
<i>Elops hawaiiensis</i>	L	L	L	L	C	L
<i>Megalops cyprinoides</i>	L	C	L	C	L	L
<i>Anguilla japonica</i>	L	C	C	C	C	L
<i>A. marmorata</i>	L	C	C	C	C	L
<i>Uropterygius concolor</i>	L	L	L	C		
<i>Pisodonophis boro</i>	L	L	C	L	L	L
<i>Herklotsichthys quadrimaculatus</i>	L	C	L			
<i>Nematalosa come</i>	L	C	L			
<i>N. japonica</i>	L	L	L	C	L	L
<i>Sardinella melanura</i>	L	C				
<i>Stolephorus indicus</i>	L	L	C			
<i>Chanos chanos</i>	L	C	L	L	C	L
<i>Carassius auratus langsdorfii</i>	T/C	C	C	C	C	L
<i>Cyprinus carpio</i>	T/C		L	C		L
<i>Misgurnus anguillicaudatus</i>	T/C	L	C	C	C	L
<i>Clarias fuscus</i>	T/C	C				
<i>Plecoglossus altivelis altivelis</i>	T/C				C	L
<i>P. a. ryukyuensis</i>			C	C		
<i>Atherinomorus lacunosus</i>	L	C	C	L	L	L
<i>Gambusia affinis affinis</i>	L	C	C			L
<i>Oryzias latipes latipes</i>			C	C	C	L
<i>Zenarchopterus dunkeri</i>	L	C				
<i>Hyporhamphus quoyi</i>	L	C	L	L	L	L
<i>Hippichthys (Hippichthys) cyanospilus</i>	L	L	C			
<i>H. (H.) heptagonus</i>	L	C				
<i>H. (H.) spicifer</i>	L	C	C	C	C	L
<i>Hippocampus kuda</i>	L	L	C	L	L	L
<i>Microphis (Coelonotus) leiaspis</i>	L	C	C	C	C	L
<i>M. (Oostethus) brachyurus brachyurus</i>	L	C	C	C	C	L
<i>Monopterus albus</i>	T/C	L	C	L		L
<i>Cociella crocodila</i>	L	C	L	L	L	L
<i>Platycephalus</i> sp. 2					C	L
<i>Ambassis commersoni</i>	L	C	L			
<i>A. interrupta</i>	L	C	L	L		
<i>A. miops</i>	L	C	L			
<i>A. urotaenia</i>	L	C	L	L	L	L
<i>Lateolabrax latus</i>					C	L
<i>Terapon jarbua</i>	L	C	C	C	C	L
<i>Kuhlia marginata</i>	L	C	C	C	C	L
<i>K. boninensis</i>	L	C	L	C	L	
<i>K. rupestris</i>	L	C	C	L	L	L

Table 2. Continued.

Scientific name	South of Yaeyama G	Yaeyama Group	Okinawa Island	Amami- ohshima Island	Oosumi Group	Japan proper
<i>Lepomis macrochirus</i>			C			L
<i>Apogon amboinensis</i>	L	C	L	L		
<i>Sillago maculata</i>	L	L	L	C		
<i>Caranx ignobilis</i>	L	C	C	C	C	L
<i>C. papuensis</i>	L	C	C	C	L	L
<i>C. sexfasciatus</i>	L	C	C	C	C	L
<i>Leiognathus equulus</i>	L	C	C	C		
<i>L. fasciatus</i>	L	C	L			
<i>Lutjanus argentimaculatus</i>	L	C	C	C	L	L
<i>L. fulviflamma</i>	L	C	C	L	C	
<i>L. fulvus</i>	L	C	C	C	C	L
<i>L. monostigma</i>	L	C	L			
<i>L. russellii</i>	L	C	L	C	C	L
<i>L. stellatus</i>	L	L	L	L	C	L
<i>Lobotes surinamensis</i>	L	L	C	L	L	L
<i>Gerres erythrourus</i>	L	C	L			
<i>G. acinaces</i>	L	C	L			
<i>G. filamentosus</i>	L	C	L	L	C	L
<i>G. sp. 1</i>		C			C	
<i>Plectorhinchus gibbosus</i>	L	C	L	C		
<i>Pomadasys argenteus</i>	L	C	L	L	L	L
<i>Acanthopagrus berda</i>	L	C				
<i>A. schlegeli</i>	T/C				C	L
<i>A. sivicolus</i>		C	C	C		
<i>Upeneus vittatus</i>	L	C	L	L	L	L
<i>Monodactylus argenteus</i>	L	C				
<i>Scatophagas argus</i>	L	C	L	L	L	L
<i>Heniochus acuminatus</i>	L	L	C	L	L	L
<i>Oreochromis mossambicus</i>	L	C	C	C		L
<i>Abudefduf vaigiensis</i>	L	L	C	L	L	L
<i>Pomacentrus taeniometopon</i>	L	C	C	L		
<i>Chelon affinis</i>	L	C	C	C	C	L
<i>C. macrolepis</i>	L	L	C	C	C	.
<i>C. melinopterus</i>	L	C	L	C		
<i>Crenimugil crenilabis</i>	L	C	L	L	L	L
<i>Ellochelone vaigiensis</i>	L	C	L	L	C	L
<i>Moolgarda pedaraki</i>	L	C	L	C	C	
<i>M. perusii</i>	L	C	L	L	L	L
<i>M. seheli</i>	L	C	L	L	L	L
<i>Mugil cephalus cephalus</i>	L	C	C	C	C	L
<i>Polydactylus plebeius</i>	L	L	C	L	L	L
<i>Meiacanthus grammistes</i>	L	C	L	L	L	L

Table 2. Continued.

Scientific name	South of Yaeyama G	Yaeyama Group	Okinawa Island	Amami- ohshima Island	Oosumi Group	Japan proper
<i>Bostrychus sinensis</i>	L	C	C			
<i>Eleotris acanthopoma</i>	L	C	C	C	C	L
<i>E. fusca</i>	L	C	C	C	L	L
<i>E. melanosoma</i>	L	C	C	C	L	L
<i>Hypseleotris cyprinoides</i>	L	C	L	L	L	L
<i>Ophieleotris</i> sp.	L	C	L	L	L	
<i>Ophiocara porocephala</i>	L	C				
<i>Acanthogobius flavimanus</i>	T/C				C	L
<i>A. insularis</i>			C	C		
<i>Acentrogobius janthinopterus</i>	L	C	L			
<i>A. moloanus</i>	L	C	L			
<i>A. pflaumii</i>	T/C	L	C	C	C	L
<i>A. viganensis</i>	L	C				
<i>Awaous melanocephalus</i>	L	C	C	C		
<i>A. ocellaris</i>	L	C	L	L	L	L
<i>Bathygobius fuscus</i>	L	C	C	C	L	L
<i>Callogobius tanegashimae</i>	L	C	L	C	C	L
<i>Drombus</i> sp.		C	C	C	L	L
<i>Exyrias puntang</i>	L	C	C	L		
<i>Favonigobius gymnauchen</i>	T/C	C	C	C	C	L
<i>F. reichei</i>	L	C	C	C		
<i>Glossogobius aureus</i>	L	C	L	L	L	L
<i>G. biocellatus</i>	L	C	C	L	C	L
<i>Gymnogobius castaneus</i>	T/C				C	L
<i>G.</i> sp. 1	T/C				C	L
<i>G. celebius</i>	L	C	L	L	C	
<i>Lentipes armatus</i>		C	L	L		
<i>Luciogobius guttatus</i>	T/C	C	L	L	C	L
<i>Mugilogobius chulae</i>	L	C	L	C		
<i>M. parvus</i>	L	C				
<i>M.</i> sp. 1		C	L	C	C	
<i>M.</i> sp. 2		C				
<i>Oligolepis acutipennis</i>	L	C	C	L	C	L
<i>O. stomias</i>	L	C	C	L	C	
<i>Oxyurichthys</i> sp.	L	L	C			
<i>O. visayanus</i>	L	L	C	L		
<i>Pandaka lidwilli</i>	L	L	L	L	C	L
<i>P. trimaculata</i>	L	C	C	L		
<i>Periophthalmus argentilineatus</i>	L	C	C	C		
<i>P. modestus</i>	T/C		C	L	C	L
<i>Priolepis semidoliata</i>	L	C	L	L	L	
<i>Pseudogobius javanicus</i>	L	C	C	L	L	

Table 2. Continued.

Scientific name	South of Yaeyama G	Yaeyama Group	Okinawa Island	Amami- ohshima Island	Oosumi Group	Japan proper
<i>P. masago</i>			L	L	C	L
<i>Redigobius bikolanus</i>	L	C	C	C	C	L
<i>Rhinogobius giurinus</i>	T/C	C	C	C	C	L
<i>R. sp. BB</i>			C			
<i>R. sp. CB</i>	T/C	C	C	C	C	L
<i>R. sp. DA</i>		C	C	C	C	L
<i>R. sp. DL</i>		C	L	C	C	
<i>R. sp. MO</i>			C	C		
<i>R. sp. YB</i>		C	L	L		
<i>Schismatogobius roxasi</i>	L	C				
<i>Sicyopterus japonicus</i>	T/C	C	C	C	C	L
<i>S. lagocephalus</i>	L	C	C	C		
<i>Sicyopus leprurus</i>	L	C				
<i>S. zosterophorus</i>	L	C	C			
<i>Stenogobius ophthalmoporus</i>	L	C				
<i>S. sp.</i>	L	C	C	L	L	
<i>Stiphodon percnopterygionus</i>	L	C	C	C	C	L
<i>Taenioides limicola</i>	L	C	L	L		
<i>Tridentiger kuroiwae</i>		C	C	C	C	
<i>Yongeichthys criniger</i>	L	C	C	C		
<i>Siganus guttatus</i>	L	C	C	L		
<i>S. spinus</i>	L	L	C	L	L	L
<i>S. sp. 2</i>	L	C	L	L	L	L
<i>Acanthurus xanthopterus</i>	L	C	C	L	L	L
<i>Sphyraena barracuda</i>	L	C	C	C	L	L
<i>Macropodus opercularis</i>	L	L	C	L		
<i>Pseudorhombus arssius</i>	L	L	C	L	L	L
<i>Bothus pantherinus</i>	L	C	L	L	L	L
<i>Arothron hispidus</i>	L	C	C	L	L	L
<i>A. manilensis</i>	L	C	L	L	L	L
<i>A. stellatus</i>	L	L	C	L	L	L
<i>Chelonodon patoca</i>	L	C	C	C		
<i>Takifugu niphobles</i>			C	C	C	L

Southern species							
Number of Species	South of Yaeyama G.	Yaeyama Group	Okinawa Island	Amami-ohshima Island	Ohsumi Group	Japan proper	
109	[Redacted]						
38	[Redacted]						
16	[Redacted]						
22	[Redacted]						
54	[Redacted]						
1	[Redacted]						
Northern species							
Number of Species	Taiwan and/or China	Yaeyama Group	Okinawa Island	Amami-ohshima Island	Ohsumi Group	Japan proper	
3		[Redacted]					
7	☆	[Redacted]					
2	☆	[Redacted]					
3		[Redacted]					
1	☆	[Redacted]					
3		[Redacted]					
10	☆	[Redacted]					
Endemic species							
Number of Species	South of Yaeyama G.	Yaeyama Group	Okinawa Island	Amami-ohshima Island	Ohsumi Group	Japan proper	
3		[Redacted]					
3		[Redacted]					
3		[Redacted]					
1		[Redacted]					
1		[Redacted]					
Total		259	213	191	180		

Fig. 4. Distribution ranges of 280 species/subspecies categorised as “southern”, “northern” and “endemic” groups (see text). Stars in the northern group category indicate records from Taiwan and/or China. Introduced species and undescribed species, with as yet uncertain distribution ranges, are excluded.

proper to the Ohsumi Group, and seven species other than *Platycephalus* sp. 2, *Lates japonicus* and *Lateolabrax latus* are recorded from China and/or Taiwan as well. *Hapalogenys nitens* and *Eleotris oxycephala* occur from Japan proper to the Amami Group, and in China and/or Taiwan. *Oryzias latipes latipes*, *Periophthalmus modestus*, *Pseudogobius masago* and *Takifugu niphobles* occur from Japan proper to the Okinawa Group, and *Periophthalmus modestus* also being recorded from China and/or Taiwan. *Carassius auratus langsdorfii*, *Misgurnus anguillicaudatus*, *Girella mezinga*, *Omobranchus loxozonus*, *Acentrogobius pflaumi*, *Eutaeniichthys gilli*, *Favonigobius gymnauchen*, *Luciogobius guttatus*, *Parioglossus dotsui*, *Rhinogobius giurinus*, *Rhinogobius* sp. CB, *R.* sp. DA and *Sicyopterus japonicus* occur from Japan proper to the Yaeyama Group, 10 species other than *Omobranchus loxozonus*, *Parioglossus dotsui* and *Rhinogobius* sp. DA also being recorded from China and/or Taiwan. All of the “northern” species, except for *Platycephalus* sp. 2 and *Lateolabrax latus*, are distributed along the Yellow Sea coast, the number gradually increasing from the southern to the northern islands with no drastic faunal change. Because the Tokara Channel, between the Amami-ohshima and Tokara islands, became a land bridge from the Riss to Würm glacial epochs (Kimura, 1996), many of the northern species may have extended their range beyond the Ohsumi group at that time. The derivations of the two primary freshwater fishes, *Carassius auratus langsdorfii* and *Misgurnus anguillicaudatus*, remain unknown. Intra-specific genetic comparisons may answer these questions, including a reconsideration of whether or not these two species are native to the Ryukyu Archipelago.

Eleven species/subspecies are endemic to the Ryukyu Archipelago (Fig. 4). *Hypoatherina woodwardi*, *Rhinogobius* sp. DL and *Tridentiger kuroiwae* to the overall chain; *Plecoglossus altivelis ryukyuensis*, *Acanthogobius insularis* and *Rhinogobius* sp. MO to the Okinawa and Amami groups; *Acanthopagrus sivicolus*, *Rhinogobius* sp. YB and *Lentipes armatus* to the Yaeyama, Okinawa and Amami groups; *Rhinogobius* sp. BB to Okinawa Island; and *Stiphodon imperiorientaris* to the Yaeyama and Okinawa groups.

Of the above 11 endemic species/subspecies, *Rhinogobius* sp. BB and *R.* sp. YB are primary freshwater fishes *sensu* Darlington (1957) are thought to be derived from amphidromous *R.* sp. MO and *R.* sp. DA, respectively, in the Ryukyu Archipelago, accompanying life-history change (Nishida, 1994; Aonuma *et al.*, 1998). Nishida (1994) discussed the possibility that paleo-sea level fluctuations (Kizaki & Oshiro, 1977; Kimura, 1996) may have been involved in such speciation events. *R.* sp. MO apparently has no closer-related congener than *R.* sp. BB, the two species forming a natural group, and their origin of endemism is unknown at present.

Six endemic species each have related species distributed allopatrically in other islands, Japan proper, and/or Taiwan and China (Nakabo, 2000); these include *Plecoglossus altivelis ryukyuensis* vs. *P. a. altivelis*, *Hypoatherina woodwardi* vs. *H. valenciennesi*, *Acanthopagrus sivicolus* vs. *A. schlegeli*, *Acanthogobius insularis* vs.

A. lactipes, *Rhinogobius* sp. DL vs. *R.* sp. LD, and *Tridentiger kuroiwae* vs. *T. brevispinis*. Nishida (1990) suggested that the differentiation age of the two subspecies of *Plecoglossus* coincided well with the formation of the Tokara Channel in the early Pleistocene (Kizaki & Oshiro, 1977; Kimura, 1996). Similar differentiation relationships to *Plecoglossus* are also evident for potamonoid crabs, newts and frogs (Nishida, 1990; Shokita, 1996; Matsui *et al.*, 1997). The speciation events of *Hypoatherina woodwardi* vs. *H. valenciennesi*, *Acanthopagrus sivicolus* vs. *A. schlegeli* and *Acanthogobius insularis* vs. *A. lactipes* may be explained by similar paleogeographical considerations. *Rhinogobius* sp. DL and *Tridentiger kuroiwae* may have similar differentiation histories, but their distribution ranges are extended to the Ohsumi Group. Different from the above-mentioned non-fish animals, many of the Ryukyu river fish go to sea at least in their early life stages. Therefore, the allopatry of each species' pair may be accomplished by competitive interaction. Future investigations of the genetic and ecological relationships between these species' pairs will hopefully clarify these issues.

The remaining two endemic species have relatives in the Philippines; *Lentipes armatus* vs. *L.* sp. (Watson & Kottelat, 1994) and *Stiphodon imperiorientaris* vs. *S. olivaceus* (Watson & Chen, 1998). Clarification of their intra-generic phylogenies will hopefully shed some light on their endemic status.

Acknowledgments

We express our gratitude to Prof. Shinsho Nishijima, formerly of the University of the Ryukyus, Mr. Moritaka Aragaki, formerly chief of the Yaeyama Branch, Okinawa Fisheries Experimental Station, the staff of the same Branch, and Messrs. Haruyasu Ishizuka and Hideo Imataka, students of Tokai University, for their help in collecting specimens; and to Dr. Akihisa Iwata, Kyoto University, Dr. Yukio Iwatsuki, Miyazaki University, Dr. Hiroshi Senou, the Kanagawa Prefectural Museum of Natural History, Dr. Yoichi Sato, the Tokushima Prefectural Museum, and Dr. Koichi Shibukawa, Matsudo Municipal Museum, for their assistance in identifying specimens. Special thanks go to Dr. Keiichi Matsuura of the National Science Museum for allowing us to access the museum collection and for reviewing the manuscript, and to Dr. Graham S. Hardy for correcting the English.

Literature Cited

- Aizawa M. & H. Senou, 1992. First record of a blennioid fish *Omobranchus elongatus* from Japan. *I. O. P. Diving News*, 3: 2–3. (In Japanese with English abstract.)
- Akazaki, M., 1989. Sparidae. pp. 530–532 in H. Kawanabe and N. Mizuno (eds.). *Fresh water fishes of Japan*. YAMA-TO-KEIKOKUSHA, Tokyo. (In Japanese.)
- Akihito, A. Iwata, K. Sakamoto & Y. Ikeda, 1993. Gobioidae. pp. 997–1116 in T. Nakabo (ed.). *Fishes of Japan with pictorial keys to the species*. Tokai Univ. Press, Tokyo. (In Japanese.)

- Akihito & K. Meguro, 2000. Review of the gobiid genus *Cristatogobius* found in Japan with description of a new species. *Ichthyol. Res.*, **47**: 249–261.
- Akihito, Prince & K. Meguro, 1975. Description of a new gobiid fish, *Glossogobius aureus*, with notes on related species of the genus. *Japan. J. Ichthyol.*, **22**: 127–142.
- Akihito, Prince & K. Meguro, 1977. First record of the goby *Mangarinus waterousi* from Japan. *Japan. J. Ichthyol.*, **24**: 223–226. (In Japanese with English abstract.)
- Akihito, Prince & K. Meguro, 1978. First record of the goby *Myersina macrostoma* from Japan. *Japan. J. Ichthyol.*, **24**: 295–299. (In Japanese with English abstract.)
- Aonuma, Y., A. Iwata, T. Asahida, H. Ida & T. Kobayashi, 1998. Genetic variation of *Rhinogobius* fishes (Pisces: Gobiidae) around the East China Sea with notes on its zoogeography. *DNA Polymorph.*, **6**: 116–122. (In Japanese.)
- Aoyagi, H., 1948. General notes on the freshwater fishes of the Ryukyu Islands. *Zool. Mag.*, **58**: 13–14. (In Japanese.)
- Aoyagi, H., 1957. *General notes on the freshwater fishes of the Japanese Archipelago*. Taishukan, Tokyo. 272 pp. (In Japanese.)
- Arai, R. & H. Hirano, 1974. First record of the clariid fish, *Clarias fuscus* from Japan. *Japan. J. Ichthyol.*, **21**: 53–60.
- Chen, I.-S., K.-T. Shao & L.-S. Fang, 1995. A new species of freshwater goby *Schismatogobius ampluvinculus* (Pisces: Gobiidae) from Southern Taiwan. *Zool. Stud.*, **34**: 202–205.
- Darlington, P. J. Jr., 1957. *Zoogeography: The geographical distribution of animals*. Wiley & Sons, New York. 675 pp.
- Hayashi, M., 1976. On the fishes of Kami-koshiki and Tanegashima Islands. *Ann. Rep. Yokosuka City Mus.*, (22): 32–36. (In Japanese.)
- Hayashi, M., R. Aoki & T. Ito, 1981a. Freshwater fishes of the Ishigaki and Iriomote Islands. *Ann. Rep. Yokosuka City Mus.*, (27): 16–23. (In Japanese.)
- Hayashi, M. & T. Ito, 1978a. Gobioid fishes of Ryukyu Islands, southern Japan (I). *Sci. Rep. Yokosuka City Mus.*, (24): 59–82, pls. 10–21. (In Japanese with English abstract.)
- Hayashi, M. & T. Ito, 1978b. Gobioid fishes of Ryukyu Islands, southern Japan (II). *Sci. Rep. Yokosuka City Mus.*, (25): 29–34, pls. 4–6. (In Japanese with English abstract.)
- Hayashi, M., T. Ito & H. Hayashi, 1992. Inland-water fish fauna and zoogeographical features in Amami Island, southern Japan. *Sci. Rep. Yokosuka City Mus.*, (40): 45–63. (In Japanese with English abstract.)
- Hayashi, M., T. Suzuki, T. Ito & H. Senou, 1981b. Gobiid fishes of the Ryukyu Islands, southern Japan (III)—suborder Gobioidae—. *Sci. Rep. Yokosuka City Mus.*, (28): 1–25, pls. 1–14. (In Japanese with English abstract.)
- Herre, A. W., 1941. Distribution of fish in the tropical Pacific. *Oceanogr. Mar. Biol.*, **4**: 587–592.
- Hirata, T., T. Yamakawa, A. Iwata, S. Manabe, W. Hiramatsu & N. Ohnishi, 1996. Fish fauna of Kashiwajima, Kochi Prefecture, Japan. *Bull. Mar. Sci. Fish., Kochi Univ.*, (16): 1–177. (In Japanese with English abstract.)
- Ishida, J., T. Suzuki & K. Tamada, 1998. *Glossogobius aureus* collected from Shizuoka and Wakayama Prefectures. *I. O. P. Diving News*, **9**: 2–3. (In Japanese.)
- Iwatsuki, Y., M. Akazaki & T. Yoshino, 1993. Validity of a lutjanid fish, *Lutjanus ophuysenii* (Bleeker) with a related species, *L. vitta* (Quoy et Gaimard). *Japan. J. Ichthyol.*, **40**: 47–59.
- Iwatsuki, Y., S. Kimura, H. Kishimoto & T. Yoshino, 1998. Validity of the gerreid fish, *Gerres macracanthus* Bleeker, 1854, with designation of a lectotype, and designation of a neotype for *G. filamentosus* Cuvier, 1829. *Ichthyol. Res.*, **43**: 417–429.
- Iwatsuki, Y., S. Kimura & T. Yoshino, 1998. Redescription of *Gerres erythrourus* (Bloch), 1971, a senior synonym of *G. abbreviatus* Bleeker, 1850 (Teleostei: Perciformes: Gerreidae). *Copeia*, **1998**:

165–172.

- Iwatsuki, Y., S. Kimura & T. Yoshino, 1998. Redescription of *Gerres baconensis* (Everman & Seale, 1907), *G. equulus* Temminck & Schlegel, 1844 and *G. oyena* (Forsskål), 1775, included in the “*G. oyena* complex”, with notes on other related species (Perciformes: Gerreidae). *Ichthyol. Res.*, **46**: 377–395.
- Japan Environmental Agency (ed.), 1991. *Threatened species of Japan—Red Data Book, Vol. Vertebrate*. Japan Wildlife Research Center, Tokyo. 340 pp. (In Japanese.)
- Japan Environmental Agency, 1999. *Red List of the brackish and freshwater fishes*, revised and announced on 18 Feb., 1999. <http://www.eic.or.jp/eanet/>. (In Japanese.)
- Japan Fisheries Agency (ed.), 1998. *Data Book for Japanese rare wild aquatics*. Japan Fisheries Resources Conservation Association, Tokyo. 437+4 pp. (In Japanese.)
- Jordan, D. S. & S. Tanaka, 1927. The fresh water fishes of the Riukiu Island, Japan. *Ann. Carnegie Mus.*, **17**: 259–278.
- Kawanabe, H. & N. Mizuno (eds.), 1989. *Fresh water fishes of Japan*. YAMA-TO-KEIKOKUSHA, Tokyo. 719 pp. (In Japanese.)
- Kimura, M., 1996. Quaternary paleogeography of the Ryukyu Arc. *J. Geogr.*, **105**: 259–285. (In Japanese with English abstract.)
- Kimura, S., T. Sado, Y. Iwatsuki & T. Yoshino, 1999. Record of an engraulid fish *Stolephorus commersonii* from Ishigaki I., southern Japan. *Japan. J. Ichthyol.*, **46**: 45–50. (In Japanese with English abstract.)
- Kizaki, K. & I. Oshiro, 1977. Paleogeography of the Ryukyu Islands. *Mar. Sci., Monthly*, **9**: 542–549. (In Japanese with English abstract.)
- Kobayashi, H., 1985. On the distribution and origin of polyploid crucian carp in Japan and its vicinity. *Mar. Sci., Monthly*, **17**: 75–81. (In Japanese.)
- Kochi, R., 1991. Freshwater and estuary fishes of Nansei Islands. pp. 341–357 in Nature Preservation Bureau, Japan Environmental Agency (ed.). *Research report on essential factors for preservation of species in Nansei Islands*. Nature Preservation Bureau, Japan Environmental Agency, Tokyo. (In Japanese with English summary.)
- Kuroiwa, H., 1927. Catalogue of fresh water fishes collected in Riukiu curve, 1912–1925. *Zool. Mag.*, **39**: 355–368. (In Japanese.)
- Masuda, H., K. Amaoka, C. Araga, T. Uyeno & T. Yoshino (eds.), 1984. *The fishes of the Japanese Archipelago*. Tokai University Press, Tokyo. Vol. 1. 456 pp. (In Japanese.)
- Matsui, M., T. Tanaka-Ueno & M. Toyama, 1997. Systematics and distribution of amphibians. *Aquabiol.*, **19**: 515–525. (In Japanese with English abstract.)
- Myers, G. S., 1949. Usage of anadromous, catadromous and allied terms. *Copeia*, **1949**: 89–97.
- Nakabo, T. (ed.), 1993. *Fishes of Japan with pictorial keys to the species*. Tokai University Press, Tokyo. 1474 pp. (In Japanese.)
- Nakabo, T. (ed.), 2000. *Fishes of Japan with pictorial keys to the species second edition*. Tokai University Press, Tokyo. 1748 pp. (In Japanese.)
- Nakamura, M., 1963. *Keys to the freshwater fishes of Japan fully illustrated in colors*. Hokuryukan, Tokyo. 260 pp. (In Japanese.)
- Nakamura, M., 1969. *Cyprinid fishes of Japan: Studies on the life history of cyprinid fishes of Japan*. Research Institute of Natural Resources, Tokyo. 455 pp. (In Japanese with English summary.)
- Nishida, M., 1990. Molecular approach to the biogeography of the Ryukyu Islands. *Biol. Mag. Okinawa*, **28**: 25–42. (In Japanese with English abstract.)
- Nishida, M., 1994. Life history variation and speciation in *Rhinogobius*. pp. 154–169 in A. Goto, K. Tsukamoto & K. Maekawa (eds.). *Freshwater fishes migrating between river and the sea*. Tokai Univ. Press, Tokyo. (In Japanese.)

- Okada, Y. & H. Ikeda, 1938. The freshwater fishes of Okinawa-zima. *Biogeographica (Trans. Biog. Soc. Japan)*, **3**: 71–86.
- Okada, Y. & H. Ikeda, 1939. The freshwater fishes of Miyako-zima and adjacent islands. *Biogeographica (Trans. Biog. Soc. Japan)*, **3**: 210–219.
- Okamura, O. & K. Amaoka (eds.), 1997. *Sea fishes of Japan*. YAMA-TO-KEIKOKUSHA, Tokyo. 783 pp. (In Japanese.)
- Okinawa Prefecture, 1996. *Threatened species of Okinawa Prefecture—Red Data Okinawa*. Okinawa Prefecture, Naha. 479 pp. (In Japanese.)
- Randall, J. E., 1998. Zoogeography of shore fishes of the Indo-Pacific region. *Zool. Stud.*, **37**: 227–268.
- Sakai, H. & M. Nakamura, 1979. Two new species of freshwater gobies (Gobiidae: Sicydiaphiinae) from Ishigaki Island, Japan. *Japan. J. Ichthyol.*, **26**: 43–54.
- Sakai, H. & M. Sato, 1982. First records of five teleostean fishes and three second records of gobiid fishes from Japan, collected in rivers on the Ryukyu Islands. *Bull. Fac. Fish., Hokkaido Univ.*, **33**: 79–88.
- Sakai, H., M. Sato & M. Nakamura, 1998. A record of the temperate bass, *Lateolabrax latus*, from a freshwater habitat of Tanegashima Island, Japan. *Japan. J. Ichthyol.*, **45**: 107–109. (In Japanese with English abstract.)
- Sakaizumi, M., 1990. Species and intra-specific variation in medaka from the genetic point of view. pp. 143–161 in N. Egami, K. Yamagami & A. Shima (eds.). *Biology of medaka*. Tokyo Univ. Press, Tokyo. (In Japanese.)
- Senou, H., 1989. Mugilidae. pp. 458–463 in H. Kawanabe & N. Mizuno (eds.). *Fresh water fishes of Japan*. YAMA-TO-KEIKOKUSHA, Tokyo. (In Japanese.)
- Senou, H., 1997. Redescription of a mullet, *Chelon melinopterus* (Perciformes: Mugilidae). *Bull. Kanagawa Prefect. Mus. (Nat. Sci.)*, (26): 51–55.
- Senou, H. & T. Suzuki, 1980a. The inland water fishes of the Yaeyama Islands, Okinawa Prefecture, Japan I. *Freshwater Fish*, (6): 54–65, pls. I–VIII. (In Japanese.)
- Senou, H. & T. Suzuki, 1980b. The inland water fishes of the Yaeyama Islands, Okinawa Prefecture, Japan II. *NANKISEIBUTU*, **22**: 65–70. (In Japanese.)
- Senou, H. & T. Suzuki, 1981a. The inland water fishes of the Yaeyama Islands, Okinawa Prefecture, Japan III. *NANKISEIBUTU*, **23**: 9–15. (In Japanese.)
- Senou, H. & T. Suzuki, 1981b. The inland water fishes of the Yaeyama Islands, Okinawa Prefecture, Japan V, correction and supplement. *NANKISEIBUTU*, **23**: 81–86. (In Japanese.)
- Senou, H. & T. Suzuki, 1992. First record of a lutjanid fish *Lutjanus goldiei* (Macleay) from Iriomote Island, the Ryukyus. *I. O. P. Diving News*, **3**(4): 4–5. (In Japanese with English abstract.)
- Senou, H., Suzuki, T. & S. Hosokawa, 1995. First record of a freshwater pipefish, *Microphis (Coelonotus) argulus* (Pisces: Syngnathidae) from the Northern Hemisphere. *I. O. P. Diving News*, **6**(3): 2–3. (In Japanese with English abstract.)
- Shibukawa, K. & Y. Taki, 1996. A new gobiid fish, *Acanthogobius insularis*, from the Ryukyu Islands, Japan. *Ichthyol. Res.*, **43**: 79–85.
- Shibuya, M. & H. Takahashi, 1998. *Stiphodon* sp. from Kochi Prefecture. *I. O. P. Diving News*, **10**(1): 5. (In Japanese.)
- Shinomiya, A., 1998. Ryukyu-ayu. pp. 158–159 in Japan Fisheries Agency (ed.). *Data book for Japanese rare wild aquatics*. Japan Fisheries Resources Protection Association, Tokyo. (In Japanese.)
- Shokita, S., 1996. The origin of land-locked freshwater shrimps and potamonoids from the Ryukyu Islands, southern Japan. *J. Geogr.*, **105**: 343–353. (In Japanese with English abstract.)
- Shokita, S., T. Yoshino & Y. Higa, 1989. River fishes and their distribution in Amami-ohshima Islands, the Ryukyu Islands. pp. 227–236 in Nature Preservation Bureau, Japan Environmental Agency (ed.). *Study of essential factors for preservation of wildlife in Nansei Islands*. Nature Preservation Bureau, Japan Environmental Agency, Tokyo. (In Japanese with English summary.)

- Suzuki, T., Y. Dotsu & H. Senou, 1982. Inland water fish fauna of the Yaeyama Group, the Ryukyu Islands. *Biol. Mag. Okinawa*, (20): 17–23. (In Japanese with English abstract.)
- Suzuki, T. & H. Senou, 1981. Freshwater gobioid fishes of the Yaeyama Islands, Okinawa Prefecture, Japan. *Freshwater Fish*, (7): 154–157, pls. I–II. (In Japanese.)
- Suzuki, T. & H. Senou, 1982. The inland water fishes of the Yaeyama Islands, Okinawa Prefecture, Japan VI. *NANKISEIBUTU*, **24**: 12–18. (In Japanese.)
- Suzuki, T. & H. Senou, 1983. The inland water fishes of the Yaeyama Islands, Okinawa Prefecture, Japan VII. *NANKISEIBUTU*, **25**: 49–54. (In Japanese.)
- Suzuki, T. & H. Senou. 1984. The inland water fishes of the Yaeyama Islands, Okinawa Prefecture, Japan VIII. *NANKISEIBUTU*, **26**: 31–38. (In Japanese.)
- Suzuki, T. & H. Senou, 1992. First record of a gobiid fish *Parioglossus philippinus* from Japan. *I. O. P. Diving News*, **3**(1): 4–5. (In Japanese with English abstract.)
- Suzuki, T. & H. Senou, 1994. *Parioglossus interruptus*, a new species of goby from the western Pacific. *Japan. J. Ichthyol.*, **41**: 281–286.
- Suzuki, T., H. Senou & M. Aizawa, 1994. Two newly recorded and one unidentified species of the genus *Parioglossus* from Japan. *I. O. P. Diving News*, **5**(9): 2–6. (In Japanese with English abstract.)
- Suzuki, T., H. Senou, K. Sakamoto, A. Iwata & M. Aizawa, 2000. Record of a gobiid *Oxyurichthys mindanensis* from Japan, and taxonomic notes on *O. ophthalmonema*. *I. O. P. Diving News*, **11**(6): 2–6. (In Japanese with English abstract.)
- Suzuki, T., H. Senou, T. Yoshino, S. Hosokawa & H. Yoshigo, 1995. First record of a gobiid fish *Belobranchius belobranchius* from Japan. *I. O. P. Diving News*, **6**(2): 4–6. (In Japanese with English abstract.)
- Suzuki, T. & K. Yano, 1991. First record of the gobiid fish *Redigobius balteatus* from Japan. *I. O. P. Diving News*, **3**(1): 4–5. (In Japanese with English abstract.)
- Takahashi, H. & H. Senou, 1995. *Kuhlia rupestris* collected from Kochi Prefecture. *I. O. P. Diving News*, **6**(6): 2. (In Japanese with English Abstract.)
- Tomiyama, I., 1936. Gobiidae of Japan. *Japan. J. Zool.*, **7**: 37–112.
- Uwa, H., 1990. Karyotype and evolution of medaka. pp. 162–182 in N. Egami, K. Yamagami & A. Shima (eds.). *Biology of medaka*. Tokyo Univ. Press, Tokyo. (In Japanese.)
- Watson, R. E., 1991. A provisional review of the gobiid fish genus *Stenogobius* with descriptions of a new subgenus and thirteen new species. (Pisces: Teleostei: Gobiidae). *Rec. West. Aust. Mus.*, **15**: 571–654.
- Watson, R. E. & I.-S. Chen, 1998. Freshwater gobies of the genus *Stiphodon* from Japan and Taiwan (Teleostei: Gobiidae: Sicydiini). *aqua, J. Ichthyol. Aquatic Biol.*, **3**: 55–68.
- Watson, R. E. & M. Kottelat, 1994. *Lentipes whittendorum* and *Sicyopus auxilimentus*, two new species of freshwater gobies from the western Pacific (Teleostei: Gobiidae: Sicydiinae). *Ichthyol. Explor. Freshwaters*, **5**: 351–364.
- Yamamoto, T., M. Ohta & C. Araga, 1997. *Hypseleotris cyprinoides* (Pisces, Gobiidae) found in the Tonda River in southwestern Kii Peninsula, Japan. *NANKISEIBUTU*, **39**: 132–134. (In Japanese.)
- Yoshino, T. & H. Yoshigou, 1998. First record of two freshwater pipe fishes of the genus *Microphis* (Synnathiformes: Synnathidae) from Japan. *Ichthyol. Res.*, **45**: 201–204.
- Yoshigou, H. & T. Yoshino, 1998. Sexual dimorphism found in the genus *Ambassis*. *Advanced abstracts, 30th ann. meet. Ichthyol. Soc. Japan*, **1997**: 11. (In Japanese.)

